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Highlights *of* 2002/03



First Darbari Seth Memorial Lecture

The first Darbari Seth Memorial Lecture – organized on 21 August 2002 by TERI, in honour of the institute's founder – was delivered by Mr Narayana N R Murthy, Chairman and Chief Mentor, Infosys Technlogies Ltd, India. The lecture was titled 'In praise of secularism: the musings of a layperson'. Dr Murli Manohar Joshi, Hon'ble Minister for Human Resource Development, Science and Technology, and Ocean Development, Government of India, delivered the presidential address.



Padma Bhushan 2003

Dr Arcot Ramachandran, Chairman, TERI, was awarded the Padma Bhushan in 2003. With a distinguished career in engineering education and energy research, Dr Ramachandran served at the United Nations; the Indian Institute of Technology, Madras; the Department of Science and Technology, Government of India; and the Council of Scientific and Industrial Research, among others. Dr Ramachandran received the award from the Hon'ble President of India, Dr A P J Abdul Kalam.

Best Paper at the 5th International Petroleum Conference and Exhibition 2003

Dr Banwari Lal, Fellow and Area Convener, Microbial Biotechnology Area of the Bioresources and Biotechnology Division, TERI, received the first prize at the 5th International Petroleum Conference and Exhibition 2003, as his paper titled 'Remediation of oily sludge: a biotechnological approach' was adjudged the best paper in the oral presentation category. Dr Lal received the award from Mr K C Pant, Deputy Chairman, Planning Commission, Government of India, in the presence of Dr Manju Sharma, Secretary, Department of Biotechnology, Government of India. Earlier, Dr Lal has received the 'Biotech Product and Process Development and Commercialization Award 2002'.





Dr R K Pachauri to head IPCC

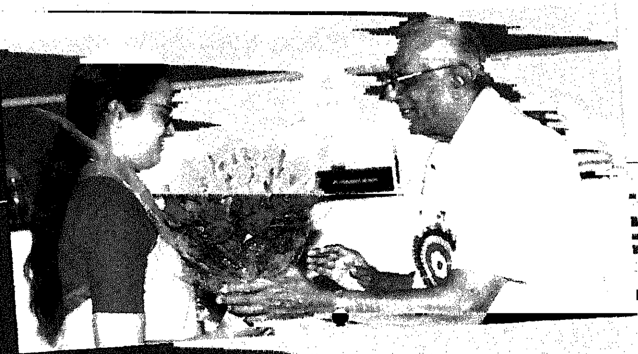
On 19 April 2002, Dr R K Pachauri, Director-General, TERI, was elected to head the United Nations Intergovernmental Panel on Climate Change. Chairing this global entity for six years, Dr Pachauri will lead the preparation of the Panel's Fourth Assessment Report of global climate change, expected in 2007.



Member, National Security Advisory Board

Dr Leena Srivastava, Executive Director, TERI, has been appointed by the Prime Minister of India as member of the National Security Advisory Board for the year 2003/04. Dr Srivastava – an expert in the areas of policy, regulation, and governance – joins the Board that comprises persons of eminence in the fields of foreign affairs, defence, economics, science and technology, internal security, and related areas.

Highlights *of* 2002/03



Noel Deer gold medal

In the 63rd Annual Convention of the Sugar Technologists Association of India, Dr Malini Balakrishnan and Mr Ananda Mohan Ghosh were awarded the prestigious Noel Deer Gold Medal, for the second time in succession—this time, for their paper titled 'Trials on ultra-filtration of hot sugar cane juice: preliminary findings'. The paper reports on a process for the production of sulphur-free refined quality sugar without using conventional sugar refining. The only similar attempt in the sugar industry has been by Koch Membrane Systems, USA. Dr Balakrishnan and Mr Ghosh received the awards from Mr Shivajirao G Patil, Chairman, Indian Sugar Exim Corporation.



Dr R K Pachauri, the anchor of corporate cricket

As a mark of distinction for his priceless contribution to corporate cricket, Dr R K Pachauri, Director-General, TERI, was given 'Special Award' by Abhi Sports Management, New Delhi. Dr Pachauri has greatly encouraged the concept of corporate cricket in Delhi, which has, over the years, helped provide a platform for amateur cricketers as well as lovers of the game. Also, Dr Pachauri has been a regular on the cricket field for several years, having achieved the unique feat of claiming more than 150 wickets in corporate matches. He received the award from Mr Rajiv Pratap Rudy, Hon'ble Minister for Civil Aviation, Government of India, in the presence of Mr M S Ramachandran, Chairman, Indian Oil Corporation Ltd, and Ms Anjum Chopra, captain of the Indian women's cricket team. The award further authenticates the kind of passion he has for the game.

Awards for Excellence 2002: Supporting Infrastructure Regulators

Each year, the President of the World Bank selects three activities undertaken by various groups within the Bank for the President's Awards for Excellence. This programme recognizes teams that contribute to the goals of the World Bank Group by achieving demonstrable results through client responsiveness, cost-effectiveness, innovation, partnership, professionalism, and teamwork. The series of innovative programmes – including regional initiatives of SAFIR (South Asian Forum for Infrastructure Regulation), African Forum for Utility Regulation, International Forum for Utility Regulation, and other related activities – undertaken by the Supporting Infrastructure Regulators Project Team of the Bank, was selected as one of the award recipients for the year 2002. TERI, being a partner organization and the host entity for the SAFIR initiative, was also recognized by the Bank for helping boost this innovative programme of work. TERI was awarded the Certificate of Excellence for the outstanding support and partnership provided to the Supporting Infrastructure Regulators Team for 2002.



Dr A R Sihag, Director, Regulatory Studies and Governance Division, TERI, receiving the award from Mr Clive Harris of the Private Sector Advisory Services, The World Bank, in the presence of Dr S K Sarkar, Senior Fellow, TERI



Director-General's Report

The year 2002/03 has been a period of intense activity for TERI. Not only have several major activities been implemented during the year but several initiatives have also been taken for the growth and expansion of the Institute and the various activities to be carried out in the near future. One notable experience generated during this year has involved probing the market for several technologies and technological initiatives that the Institute has developed recently. While some of these initial efforts have had modest success, it has also become clear that TERI must strengthen its efforts and capabilities to serve the needs of the market more effectively for economic benefits to the society as well as for financial viability of the Institute's activities.

Market orientation has assumed particularly great importance in respect of several of TERI's biotechnology programmes. This represents a sea change from the situation that existed in TERI's nascent biotechnology activities 10 years ago. At that stage, the emphasis in TERI's efforts reflected a strong desire to build cutting-edge capabilities, covering the staff and infrastructure of the Institute. Today, a number of biotechnology programmes have developed technologies with substantial market potential. The MTP (Micropropagation Technology Park) built up with initial support from the Department of Biotechnology, Government of India, has now crossed the 10-million mark in production of plantlets for a wide range of applications and a diverse set of users. The MTP is a unique facility designed and built by TERI's staff in the early 1990s—a stage when very little experience existed in the country on the design and construction of such facilities. Over the years, through several innovations, the cost of production of tissue-cultured plants in this facility has been brought down significantly with economic benefits for all stakeholders.



TERI's Micropropagation Technology Park at Gurgaon

Another family of important technologies developed by TERI relates to applied research in microbial biotechnology. Today, TERI's Oilzapper technology – using microbes specifically developed by TERI – is being used by major refineries in the country for remediation of oil sludge and oil spills in several locations in an economically

desirable manner. Mycorrhiza, another family of microbes, is being used for applications such as treatment of fly ash dumps at thermal power plants as well as cultivation of a bio-diesel species called *Jatropha* in the desert regions of Rajasthan. In addition to these technologies, which have direct marketing opportunities, another area in which TERI's work has major social benefits is that of nutritional improvement of mustard varieties. These are transformed through genetic engineering to provide Vitamin A in the cooking oil that a large number of poor people in several parts of India use extensively.

In the Energy–Environment Technology Division, TERI's activities have been successfully carried offshore through specific assignments implemented in Malaysia; the development of an improved furnace design based on rice husk combustion for a rice mill in Bangladesh; and through the provision of technical know-how for improving the energy efficiency of brick kilns in Nepal and establishing a thermal gasifier in Myanmar. TERI has also successfully pursued its activities as a co-coordinator in an international project on solar and wind resource assessment in 13 countries. As part of this activity, TERI also provided training on the use of a particular software for resource assessment to national agencies in Bangladesh, Nepal, and Sri Lanka. TERI's work on biomass gasification has found new applications, including its use for an eco-friendly, gasifier-based crematorium at Ambernath in Maharashtra.

TERI's RETREAT (Resource-Efficient TERI Retreat for Environmental Awareness and Training) in Gurgaon, Haryana – designed and built with unique features of energy-efficient design and renewable energy uses – continues to inspire several organizations to incorporate these concepts into their building plans. Consequently, TERI's services in this field of expertise have been sought and utilized in a recently completed building for the Biosciences and Bioengineering Department in the Indian Institute of Technology–Kanpur; the West Bengal Renewable Energy Development Agency's Solar Housing Project, the Confederation of Indian Industry–Godrej Green Business Centre in Hyderabad, and upcoming office buildings of the National Thermal Power Corporation, among several others.



Front view of TERI's RETREAT building at Gurgaon

TERI's activities in providing policy analysis and training inputs for a range of policy-related subjects continue to be the bulwark of TERI's strengths. However, in all policy-related research areas, considerable importance is placed on implementation of projects and field experience, which not only provide validation for TERI's research itself but also ensure that the capacity of the Institute is also utilized for creating skills and

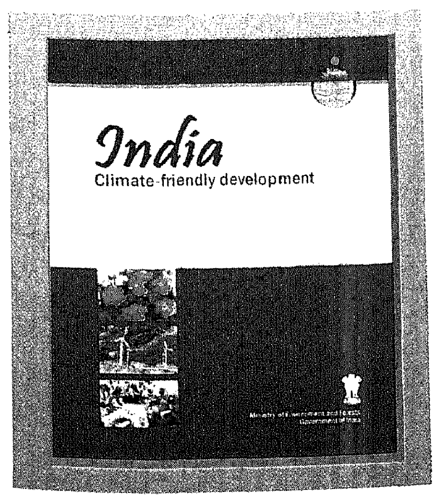
capabilities in other organizations, which have a critical role in implementing appropriate policies. Accordingly, TERI's Rural Energy Group continues to expand its activities in rural areas involving local communities in devising energy-efficient and renewable-energy-based solutions to meet very basic rural needs. Similarly, in the forestry field, TERI's experience in joint forest management, generated over a decade with the involvement of state forest departments and local communities, is being put to effective use in a similar partnership programme with the TVS Group of Companies. Meanwhile, the South Asia Forum for Infrastructure or SAFIR has established itself as a major initiative in the South Asian region for training, information exchange, and capacity building in infrastructure regulation—a challenge that all the countries of this region face.

With growing emphasis on the need to improve air quality, particularly in major Indian cities, research and development for solutions that are cost-effective and technically sound acquires great relevance. TERI's work reveals that while the compressed natural gas initiative implemented in Delhi's transport sector will undoubtedly improve air quality, there are other options that would have been far superior. A major project in partnership with a large number of Indian institutions and organizations and specialized agencies of the British government has provided considerable know-how on optimal solutions for managing environmental impacts of the transport sector in Indian cities.



TERI's side event at CoP-8, 2002

TERI was a major partner of the Government of India in CoP-8, the eighth session of the Conference of the Parties to the United Nations Framework Convention on Climate Change, held in New Delhi in 2002. TERI also created the web site for this event and provided extensive support for much of the documentation, as indeed was the case with material produced on behalf of the Government of India for the World Summit on Sustainable Development held in Johannesburg in August–September 2002.



To create greater understanding and awareness on environmental issues and CSR (corporate social responsibility), TERI has also instituted a set of awards on CSR for the corporate sector. Activities for promoting environmental education among schoolchildren were carried several steps further by

expanding the geographical coverage of TERI's well-established Green Olympiad and *TERRAQuiz* programmes.



Mr Vinod Khanna, former Hon'ble Minister of State for Tourism and Culture, awarding the winners of *TERRAQuiz 2002*

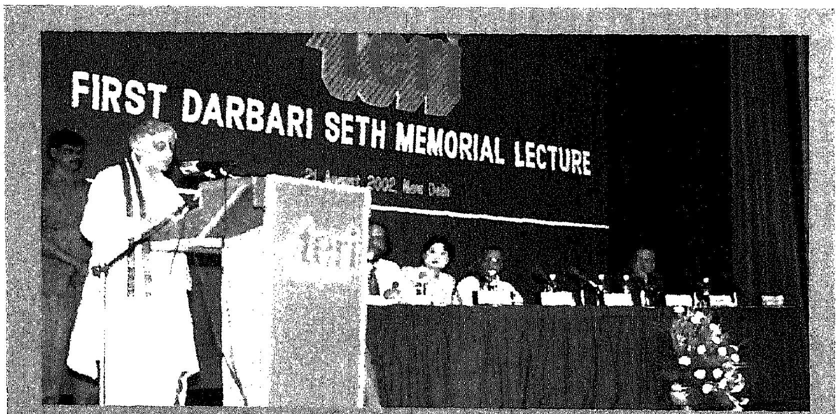
TERI has emphasized the development of IT (information technology) infrastructure and capabilities from its very inception. One of TERI's first activities was the creation of a documentation centre and library in the mid-1970s. Over the years, this library has grown to a size and outreach that makes it perhaps the largest of its kind in a developing country. The Publications Unit is responsible for production of printed materials, which cover a range of subjects, representative of TERI's research activities and interests. An important publication that has been produced during the current year – *Communicating in Style* – deals with the art and science of communicating through the written word. *TerraGreen*, TERI's electronic magazine reaches out to over 30 000 subscribers spread across 135 countries, and has developed a niche for itself in the field of environmental awareness and information dissemination.

The Centre for Information Technology Applications is developing a set of computer-based training packages for in-house applications. It has also developed a comprehensive Enterprise Resource Planning system, which is used regularly for several management and accounting systems within the Institute and as a basis for training professionals in other organizations as well. A Knowledge Management Repository has also been developed and is used extensively by the staff. The Centre for Information Technology and Networking has worked over the year to improve connectivity between TERI's various offices and to upgrade IT infrastructure within the Institute. State-of-the-art videoconferencing facilities established in New Delhi have been utilized effectively for 33 programmes conducted during the year including those as a Distance Learning Centre under the World Bank's Global Development Learning Network.

An important part of TERI's mission is to communicate with the public. For this purpose, TERI not only organized events to provide information and knowledge to the media but also produced a series of seven films dealing with the environment and related issues.

TERI's regional centres function to serve essentially the regions where they are located. This year, infrastructure was created to launch the new centre established in Uttaranchal to deal with Himalayan issues and problems. The TERI School of Advanced Studies, the university arm of TERI, recognized in 1999 as a Deemed-to-be-University by the University Grants Commission and by the Ministry of Human Resource Development, continued its growth with another batch of Ph.D. students being admitted and preparations being completed for launch of two M.Sc. programmes during the academic year 2003/04.

TERI places great emphasis on human resource development within the Institute. A series of training activities is organized for the benefit of TERI staff to keep them at the cutting edge of knowledge in their fields of expertise as well as to ensure that the Institute functions in an environment of effective teamwork and high organizational productivity. In order to perpetuate the memory of TERI's founder, Mr Darbari Seth, the Darbari Seth Memorial Lecture series was launched during the year, and the first lecture was delivered by Mr N R Narayana Murthy, Chairman and Chief Mentor of Infosys Technologies Ltd. The launch was presided over by India's Hon'ble Minister for Science and Technology, Dr Murli Manohar Joshi. The lecture was extremely well attended and the publication brought out by TERI for wide dissemination attracted a great deal of interest from a wide range of persons drawn from various walks of life, both in India and abroad.



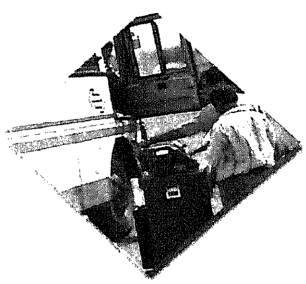
Dr Murli Manohar Joshi delivering the presidential address

TERI has major plans for expansion of several of its activities, including the higher education initiatives of the TERI School of Advanced Studies in the immediate future. For this purpose, several new facilities and infrastructure would need to be developed, which it is hoped would be completed by the end of 2005. The immediate future presents challenges, which carry considerable excitement for the staff of the Institute, and it is with a deep sense of commitment and missionary zeal that the Institute has embarked on ambitious plans that will be pursued in the years ahead.

Policy Analysis Division

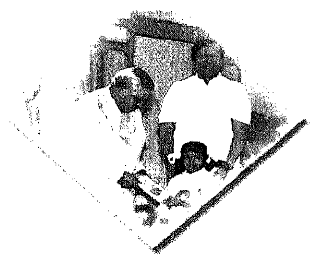


- Centre for Environmental Studies
- Centre for Global Environment Research
- Environmental Education and Awareness
- Modelling and Economic Analysis (including GIS)
- Resource and Development Economics
- Trade and Environment
- Urban and Transport Systems
- Water Resources Policy and Management









Visit our web site <www.teriin.org>

Policy Analysis Division

The Policy Analysis Division's mission is to seek and develop solutions to a wide variety of current and emerging policy and management issues. The Division uses innovative and participatory approaches structured to encourage substantive interaction with governments, corporates, and communities in its research and analysis.

In 2002/03, through its different workgroups, and its cross-functional, multi-disciplinary teams, the Division

- investigated the environmental dimensions of economic activities and resource-use patterns and explored strategies to mitigate the adverse effects;
- sought to integrate the long-term goal of sustainable natural resource management with the immediate objectives of economic growth and poverty alleviation;
- facilitated the development of sustainable policies for managing urban infrastructure and transport systems;
- identified, analysed, and prioritized policy options in energy, environment, and international trade; and
- undertook research and outlined initiatives to promote effective and equitable solutions to global environmental challenges, taking into account developing-country concerns.

GREEN India 2047

The Division coordinates the GREEN India 2047 (Growth with Resource Enhancement of Environment and Nature) project—a flagship project of TERI. Thus far, the GREEN India series has analysed trends in the state of India's natural resources in the first 50 years of independence (1947–97) and projected trends 50 years into the future (1997–2047), examining the implications of 'business-as-usual' trends and strategies for a more sustainable 'alternative scenario'. The latest addition to this series, launched in 2002, examines major socio-economic developments and trends in the state of resources during 1997–2002, prescribing urgent interventions to check and reverse perverse trends.

As part of its efforts to promote greater understanding of impacts of climate change and encourage the development of potential mitigation initiatives, the Division undertook a range of interesting and innovative research and outreach activities. Lessons learnt during case studies undertaken in Chhattisgarh, Goa, Karnataka, Orissa, Rajasthan, and Uttaranchal enhanced the understanding of the potential impacts of climate change on the agricultural sector in India and the existing coping capacity. The Division also assisted promoters of wind- and biomass-based power projects to obtain benefits for greenhouse gas reduction under the clean development mechanism. In addition, large mitigation projects in urban transport in India have been developed in partnership with a European NGO, and with support from the Ford Motor Company.

A science-based policy dialogue, known as HOT (Helping Operationalize Article Two of the UNFCCC [United Nations Framework Convention on Climate Change]), organized by the Division encouraged thinking on long-term policy issues in climate change to explore equitable and effective ways to avoid dangerous interference with the climate system. The CoP-8 (the eighth session of the Conference of Parties to the UNFCCC) held in Delhi proved to be a major event both as an opportunity for contributing policy inputs to the national and international climate change community and for outreach.

In the energy sector, the Division reviewed developments in Asia in the past 25 years, evaluating the sector's sustainability through its linkages with the economy, society, and the environment. To promote better appreciation of interlinkages between energy and other natural resources in peri-urban areas, the Division initiated a project through a thematic network of six national and international institutes with a focus on energy and transport issues. To further the Division's activities in modelling and economic analysis of the energy sector, a three-day workshop on rural energy transitions was organized in collaboration with Stanford University, US. The workshop focused on the linkages of the rural energy sector with other development sectors and on the extent of inclusion of rural energy data in energy models used in India.

In the transport sector, the Division actively assisted governments in developing urban transport policies and strategies to achieve social, environmental, and economic goals. To develop sustainable policies, key issues like integrating environment and energy concerns in transport policy, evaluating alternative fuel and technology options, and facilitating reforms for efficient service delivery were explored this year.

As the issues in the urban and transport sectors are multifaceted and require several integrated interventions, the Division seeks to develop potential solutions in collaboration with internal and external groups. With support

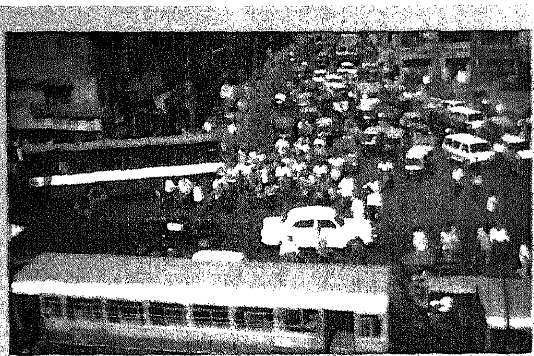
TERI at CoP-8

CoP-8 (the eighth session of the Conference of Parties to the United Nations Framework Convention on Climate Change) was held in New Delhi, India, from 23 October to 1 November 2002. TERI, among many other NGOs, has observer status at CoP negotiations, which primarily involve government representatives. However, alongside CoP sessions, NGOs organize special events, which help showcase their research and views about key issues of climate change to government negotiators, the scientific/research community, NGOs, business representatives, academics, students, and mediapersons. At CoP-8, TERI organized a number of such events.

As part of its endeavour to prepare the upcoming generation as environment-conscious and responsible leaders of tomorrow, TERI brought together students from 25 Delhi schools to discuss climate change issues and solutions, and prepare a *Children's Charter on Climate Change*, which was presented to CoP-8 delegates.

Another side event, titled *Coping with a Changing Climate*, took up issues of vulnerability and adaptation to climate change. In four separate events organized in association with Trade Partners (UK), Confederation of Indian Industry, World Business Council for Sustainable Development, European Federation of Transport and Environment, and Pembina Institute for Appropriate Development, participants deliberated on clean development mechanism opportunities and implementation. Along with TERI's exhibits at the Vigyan Bhavan and Ashoka Hotel venues of CoP-8, these events formed an informative and useful backdrop to the official conference.





A crowded Delhi transport system



Emission test being conducted on a heavy-duty diesel vehicle

from the Department of Transport, Government of the United Kingdom, the Division is currently undertaking field evaluations of various fuel and technology options for buses in partnership with the ARAI (Automotive Research Association of India). In addition, to assess economic and social sustainability concerns associated with alternative fuel options for the transport sector, the Division has estimated the cost of supplying compressed natural gas and ultra low sulphur diesel to the city of Mumbai with support from the Asian Development Bank.

Also in partnership with the ARAI, the division developed a technical and regulatory framework for inspection and maintenance of in-use vehicles, including a detailed action plan for introducing a modern inspection and certification regime for Delhi and Mumbai. Recognizing the importance of this issue, the Ministry of Road Transport and Highways, Government of India, has set up two committees to develop an action plan for inspection and certification for the country—one focusing on technical issues and the other on policy issues. TERI has been nominated as the Member Secretary for both committees.

Sustainable solution for South Asia

High poverty and unemployment, low access to sanitation facilities, and a continuing agro-based economy are some indicators of the need to revisit the current development path in South Asia. Technology, social and health issues, and governance are key interventions that have made, and will continue to make, a crucial difference for the South Asian countries, in their quest for sustainable development.

To understand complex society-environment interactions, identify change agents, and explore development strategies, TERI – in collaboration with the International Human Dimensions Programme on Global Environmental Change—Industrial Transformation, Global Change System Analysis, Research, and Training, and the International Development Research Centre – organized a two-day conference on 10 and 11 February 2003, in Delhi. The conference had participation from several countries in the South Asian region from a range of NGOs, governments, policy-making bodies, regional and international institutions, scientific and research institutions, strategic analyses bodies, and universities.

The deliberations focused on making available such basic amenities as food, water, transport, and energy to all and also tried to link local and corporate governance together with ICTs (information and communication technologies), which can show the 'sustainable' way forward.

Various case studies on technological interventions highlighted the need to redirect the focus of research on environmentally benign technologies. Besides a strong need to develop linkages among local, regional, and global governance, what is important is to boost synergy among political, corporate, and technical areas, and combine research with policy issues to reach the populace—critical to the development process. The prerequisite here is to ensure good governance. And to do this, a participatory institutional framework, which has already proved to be a success in many countries in the region, should be adopted more widely. Some of the key gaps identified by experts were in the areas of ICT, policy change, research communication, and measurement of political, social, and policy impacts.

With water scarcity becoming a real threat quality, the Division is actively involved in various activities related to water resources policy and management—be it evaluating and modelling water quality and availability, studying the socio-economics of water management, or guiding water system efficiency and watershed planning. During the last year, the Division evaluated 'Swajal', a World Bank-funded rural water supply and environmental sanitation project in Uttar Pradesh, assessing the quality of drinking water of over 5000 water supply schemes. The Division also conducted an educational and awareness programme on water-quality-related issues in this region. In the urban waste water sector, studies were undertaken to analyse the impact of major drains joining the Yamuna river to find solutions for minimizing the negative impact. In addition, activities of the Division in the water sector also include a regional dimension such as post-impact evaluation of major water projects including beneficiary surveys and impact evaluation of climate change on water resources.


A villager disinfecting the water from a handpump

The WTO (World Trade Organization) launched a new round of negotiations in November 2001 on a range of issues, holding the promise of bringing the concerns of developing countries to

Towards safe drinking water

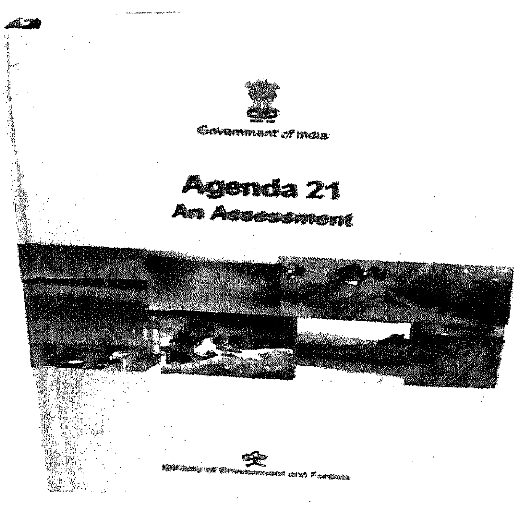
Under the Swajal project, about 3250 drinking water supply schemes – including hand pumps and piped water supply – were constructed, covering 356 villages spread over the entire Bundelkhand region of Uttar Pradesh. TERI was entrusted with the objective of examining water quality of water supply schemes along with capacity building of the rural communities on issues related to safe water, health, and hygiene in Swajal villages of the Bundelkhand region. The various activities in the project are listed below.

- Monitoring and analysis of water quality, including environmental sanitation survey for hand pumps and piped water schemes in the field laboratories, have been carried out. A reconnaissance survey to the villages has also been done for secondary data collection from the respective DPMUs (district project management units) to understand the history of functioning of both the piped water supply and hand pump schemes.
- As many as 5577 hand pumps (both Swajal and non-Swajal) and 28 piped water supply schemes were covered as part of the water quality monitoring exercise in seven districts, providing detailed district-, block-, and village-level analyses. A geographical information system framework has also been developed for spatial analysis of primary and secondary data.
- A detailed sanitary survey to identify possible sources of water contamination was carried out. Based on the observations, corrective actions desired for ensuring safe water quality have been implemented.
- A community-based participatory approach was used to build awareness among the villagers, particularly women and children, towards the linkages between water quality and health impacts, maintenance of hand pumps, personal hygiene, and sanitation practices.
- An MIS (management information system) has been developed for improving efficiency of recording and reporting the results of water quality monitoring at both the VWSC (village water and sanitation committee)-DPMU level and DPMU-PMU level, reflecting the need for any action at any specific level. The MIS will support effective supervision, planning, and decision-making on water quality monitoring activities.

centre stage. The Division, with its macro view of sustainable development, has been undertaking focused research on the linkages between trade liberalization and environmental protection, particularly in light of the trade and environment negotiations within the WTO. It advises the Ministry of Commerce and Industry, Government of India, on an ongoing basis, on the relationship between WTO rules and multilateral environmental agreements, trade and non-tariff barriers that the Indian environmental goods and services sector may face, market access issues arising out of environmental requirements, as also the impact of eco-labels on the export potential of Indian goods. As part of this initiative, the Division organized several workshops on these topics to build the capacity of Indian industry.

In collaboration with the International Institute of Sustainable Development, Canada, and the Earth Council, US, the Division is attempting to tackle the issue of domestic and trade-related subsidies and its interplay with WTO agreements. More specifically, it has mapped the subsidies prevalent in South Asia (Bangladesh, India, Nepal, Pakistan, and Sri Lanka) in the energy, infrastructure, agriculture, social, and export sectors and analysed select trade, environmental, and social implications of subsidies. This will be followed by a larger initiative, in collaboration with other developed- and developing-country research institutes, to analyse trade-related subsidy concerns. In addition, the Division would also explore how globalization is linked to vulnerability assessments and responses in the fishery and handloom sectors of India.

Exploring environment- and health-related issues, the Division initiated an investigation on the effects of using biomass as fuel in the villages of Ballabhgarh, Haryana, and the link with eye-related ailments in the elderly. Another study explored the risks involved in plastic recycling and found that workers engaged in such activities suffered from musculo-skeletal, skin, and hearing disorders. As the intricate linkages between the state of natural resources and human well-being are at the core of TERI's activities, the Division plans to establish a centre on population, health, and environment, to assess the damage to human health and its associated economic and social costs.



In preparation of the World Summit on Sustainable Development held in Johannesburg in 2002, the Division had undertaken an assessment of India's experience in implementing *Agenda 21*, the blueprint for sustainable development adopted at the historic 1992 Rio Summit, for the Ministry of Environment and Forests, Government of India. The Division continued to advise the government on incorporating sustainability concerns in its annual budgetary exercise using market-based instruments and also examined the environmental implications of the Union Budget 2002/03.

Involving corporates as active players in sustainable development efforts, the Division continued its efforts through CoRE–BCSD, India (Corporate Roundtable on development of strategies for the Environment–Business Council for Sustainable Development)—a growing community of 47 leading Indian corporates united in their bid to achieve the dual goals of environmental and economic excellence. CoRE–BCSD, India, is partnered with the World Business Council for Sustainable Development. Continuing its engagement of the corporate sector, the Division advised a large Indian automobile major on sustainable approaches in its corporate strategy.

If the issues tackled by the Division are diverse, so is the target audience—comprising government bodies, corporates, experts, academicians, stakeholders, and children. The Division is making an all-out effort to inculcate, among young minds, a sense of respect and responsibility towards the environment, under various programmes like CAMPS (Community Adoption and Monitoring Programme for Schools), YAP (Yamuna Action Plan), eco-clubs, and events like annual Earth Day and World Environment Day celebrations.

Of initiatives, awards, and rewards

Does CSR (corporate social responsibility) make good business sense for enterprises? Can small environmental initiatives and innovative practices by enterprises towards sustainable development make a profound impact on the environment, without drilling holes in the pockets of the businesses?

The need to imbue CSR in company policy has grown out of the concern to manage issues that affect business reputation and to respond to the growing needs and concerns of a range of different stakeholders.

To provide impetus to the environment management process and give due recognition to efforts made by corporates, TERI instituted the Corporate Environmental Awards in 2000/01 to recognize leadership efforts; encourage innovative practices, programmes, and projects; and boost sustainable initiatives.

Dr R K Pachauri, Director-General of TERI, says that the TERI Corporate Environmental Awards were constituted with a very focused social intention. 'We started this process aiming at recognizing the efforts of the corporates, who are concerned with the environment. Also, we wanted more and more companies to be interested in this mission,' he points out.

A five-member jury meticulously examined the 110 entries received for the Corporate Environmental Awards 2001/02 in three categories this year and identified six companies, which stood out from the rest.

In Category I (turnover up to Rs 100 crore), the Orchid Ecotel topped the fray, bagging the first prize. The Orchid, Asia's first five-star ecotel, set a new standard of environmental responsibility by conserving natural resources—using vermiculture to deal with waste, adopting green purchasing policies, and reducing packing material by 36%. The second prize was awarded to MK Electric (India) Ltd – a leading manufacturer and supplier of circuit protection, wiring devices, cable management, and datacoms – for an improved design that optimizes the use of plastic.

In Category II (turnover between Rs 100 crore and Rs 500 crore), the Andhra Pradesh Paper Mills Ltd won the award for its chemi-washer system, which ensures water conservation.

In Category III (turnover above Rs 500 crore), Harihar Polyfibers' clean technology initiatives bagged the first prize. Chennai Petroleum Corporation Ltd came second for its role in maintaining eco-balance through a number of environmental controlled measures. The third prize went to Hero Honda Motors Ltd for energy conservation by substituting electrical exhaust fans with roof wind ventilators.

By moving beyond the conventional image of the private sector – of not simply creating profits and value, but also becoming model citizens in the local and global community – this award recognizes the sincere efforts put in by organizations and offers to show the way forward.



The Orchid Ecotel received the first prize in the Corporate Environmental Awards 2001/02

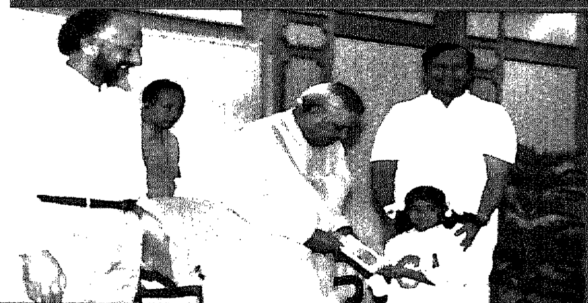
Earth Day 2003

As part of its massive outreach efforts to sensitize schoolchildren on environmental issues and concerns, TERI has been celebrating Earth Day since 1996. Earth Day 2003 was organized in partnership with the Ministry of Environment and Forests, supported by Coca-Cola India. A series of events based on a common theme – 'One Earth, One Spirit!' – marked the day, as schoolchildren from all over Delhi participated in the celebrations with great enthusiasm.

Students participated in various competitions such as ing, poster-making, and inter-school quiz and also ed a dance inspired by nature and a play titled *a ki Mahima*.

e high point of the day was the Earth Day rally, ich was attended by 1200 schoolchildren. The rally was ged off by the Minister for Environment and Forests, T R Baalu, who said that in schoolchildren lies the ope one has of bringing about a paradigm shift in ay adults look at earth. Around 80 representatives he rally met the Hon'ble Prime Minister, Mr Atal Bihari Vajpayee, and presented him an Earth Pledge.

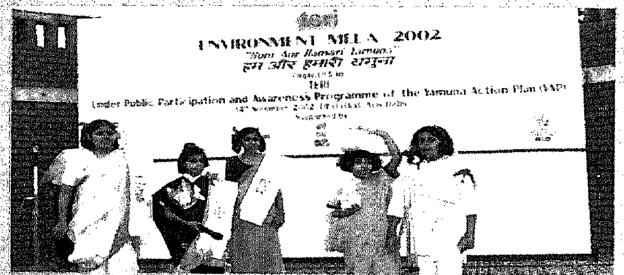
nners of the various events were felicitated in a al prize distribution ceremony. Also, the *TERI-EKO h Day Trophy* – constituted by TERI and Coca-Cola ndia – was presented to Manav Sthali School, Rajinder lagar, for its overall outstanding performance.



Mr A B Vajpayee, Hon'ble Prime Minister of India, awarded certificates to the participants of the Earth Day programme



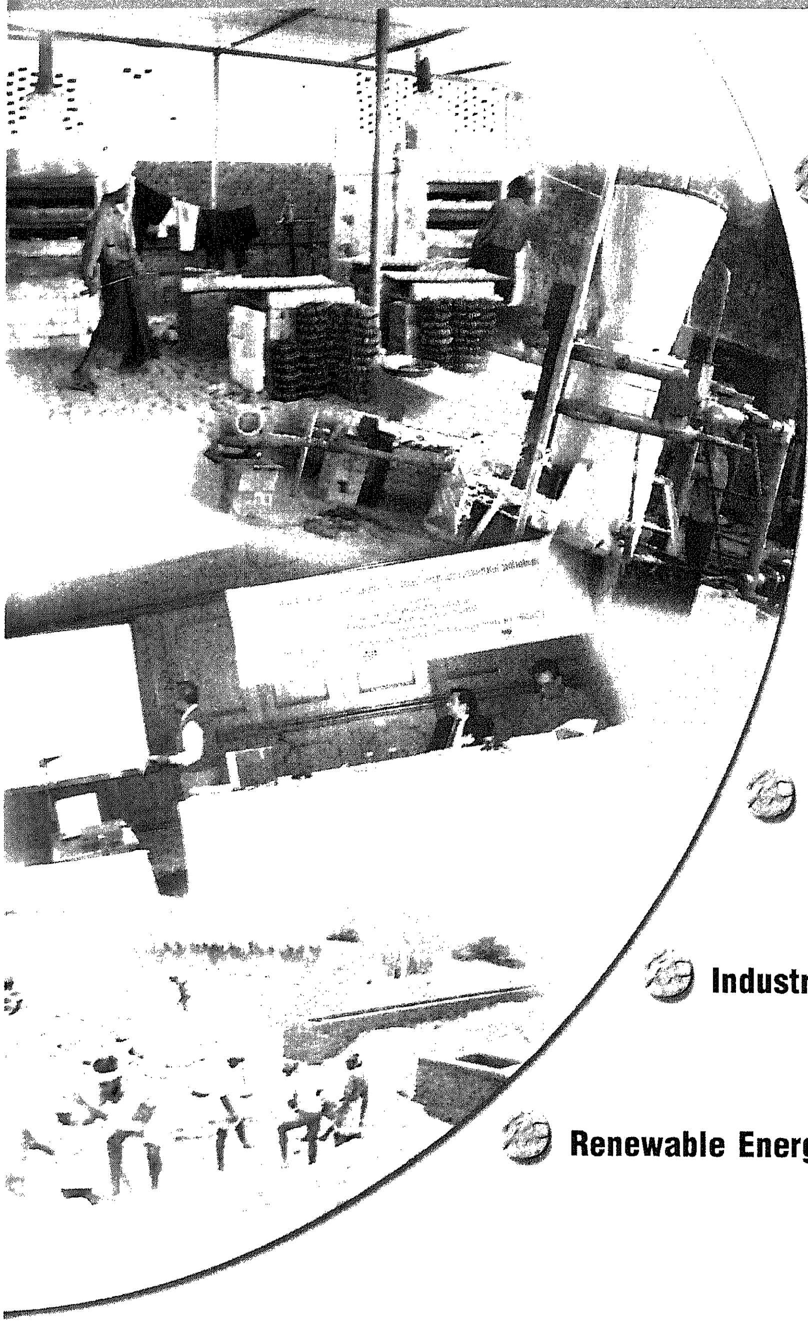
Children planting trees on World Environment Day 2002



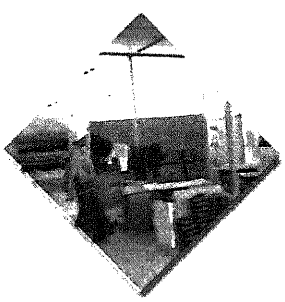
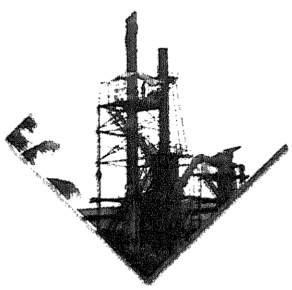
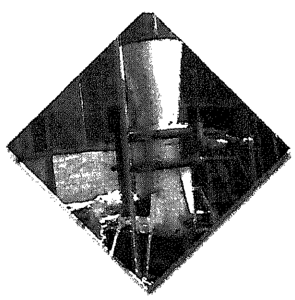
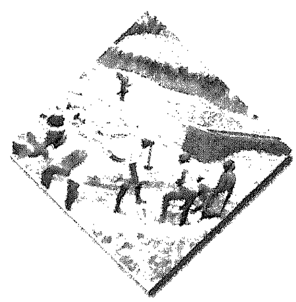
Schoolchildren participating in the Environment Mela 2002

The Division aims to further the development of an analytical framework in India through a major study on facilitating optimal exploitation of energy resources through appropriate technology deployment while addressing issues related to energy efficiency, access, affordability, financial and environmental sustainability, and security of supply.

Energy–Environment Technology Division



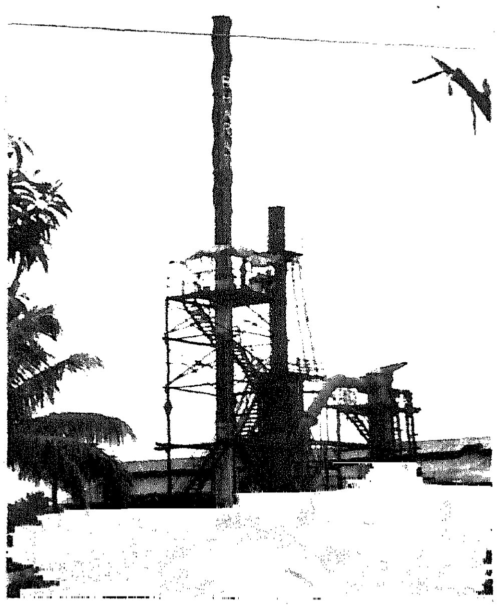
- Biomass Energy Technology Applications
- Centre for Research on Environmentally Sound Technology Applications
- Centre for Research on Waste Management
- Chemical and Hydrogen Energy
- Industrial Energy
- Renewable Energy Technology Applications

The Energy–Environment Technology Division aims to promote efficient and optimal utilization of resources through the development and diffusion of cleaner technologies. Through its six areas, it works to analyse, advocate, and apply solutions that are sustainable—both environmentally and economically. The overall objectives that guide its research and development are as follows.

- Find clean technological solutions for the industry and help promote the adoption of such technologies.
- Develop products, markets, and services based on renewable energy technologies to help popularize renewables.
- Develop technologies and products that will lead to efficient and environment-friendly utilization of available biomass resources.
- Provide 'green' solutions for the management of solid and liquid wastes across different consumer sectors.

In tune with these objectives, the Division utilized 2003/04 to successfully develop and disseminate new and innovative technologies and endeavoured to take these solutions forward from the laboratory to the field.


Foundry: demonstration plant at Howrah

India's small-scale industries are still woefully energy-'inefficient' and environment-'unfriendly'. Under three ongoing initiatives for the glass, foundry, and brick sectors, TERI has demonstrated energy-efficient technologies, which hold the potential to reduce energy consumption in the units by as much as 20% to 50%. During the year, an all-out effort was made to popularize these technologies at the grass-roots level.

- In the glass sector, the replication of the TERI-designed gas-fired muffle furnace in Firozabad – the hub of the glass industry – gained further momentum, with the number of units rapidly increasing to 30. These furnaces offer a reduction of nearly 30% in energy consumption compared to coke-fired counterparts. They also promise decreased running costs, enhanced pot life (from three months to two years), and reduced health implications.
- In the foundry sector, the energy-efficient cupola, demonstrated by TERI in Howrah and later

replicated at Nagpur (Maharashtra) and Hooghly (West Bengal), gained acceptance in other parts of the country, with entrepreneurs coming forward to set up plants in Rajkot (Gujarat) and Coimbatore (Tamil Nadu). This has resulted in energy savings ranging from 35% to 65%, and has drastically brought down the levels of suspended particulate matter to permissible limits.

- In the brick sector, TERI was involved in the dissemination of the VSBK (vertical shaft brick kiln) technology, which has resulted in significant improvements in energy and environment performance. Its success can be gauged by the numbers: today there are more than 25 VSBKs operating in different parts of India.

This 'energetic' Division consolidated its pre-eminent position as a core advisory body in the field of industrial energy conservation. TERI's pioneering work in the field of energy auditing over the past 20 years received international recognition when it bagged a prestigious assignment from the Malaysia Energy Centre (under the Malaysian Industrial Energy Efficiency Programme assisted by the United Nations Development Programme) for carrying out a detailed energy audit of the Pusat Sains Negara (National Science Centre) in Kuala Lumpur. Based upon field measurements and detailed analyses, the project identified various techno-economically viable solutions to minimize energy consumption in the building. Among several other similar projects, the Division executed the energy audit of the Gujarat refinery of the Indian Oil Corporation Ltd. It has also recently completed a study to develop energy management policy guidelines for six energy-intensive industries under an initiative of the Bureau of Energy Efficiency.

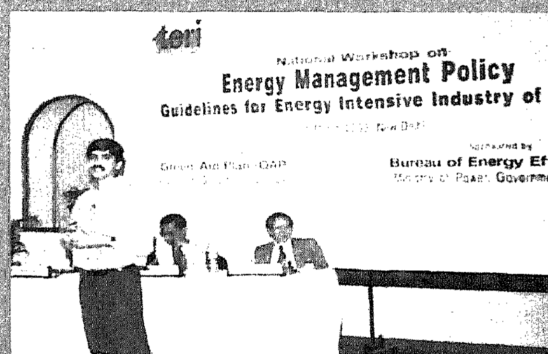
During 2002/03, the Division continued its work on the development and promotion of renewable and biomass-based technologies and services. While efforts are on to disseminate biomass-gasifier-based devices for thermal applications through licensee manufacturers, in various industries such as crumb rubber drying, textile dyeing, and silk reeling, preparatory work was initiated for the deployment of small (10–25 kW) biomass power plants in eight tribal villages in southern Orissa. The development of a fuel-saving, gasifier-based crematorium is another innovation that deserves elaboration (see box).

Guidelines for energy-intensive industries

India's energy intensity per unit of gross domestic product is 3.7 times that of Japan. Not only does this indicate the high levels of energy wastage but also the massive potential for energy saving. With the enactment of the Energy Conservation Act, 2001, the Government of India has taken the first step. What is important is to translate the words into efforts and results.

To get the right feelers from representatives of the industry, TERI organized a workshop titled *Energy Management Policy: guidelines for energy intensive industry of India*, on 1 March 2003 in New Delhi, under a project sponsored by the Bureau of Energy Efficiency, Ministry of Power, Government of India. The project aims to develop – through a participative process – pointers to help industries streamline their energy usage. The Japan Overseas Development Corporation and the Green Aid Plan of the Government of Japan also extended their support to this project.

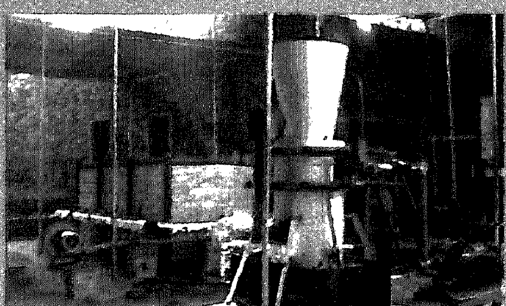
The views and suggestions of representatives from six selected industries (cement, pulp and paper, fertilizers, aluminium, petrochemicals, and steel), including the respective industry associations, were solicited to help TERI researchers prepare a blueprint of guidelines.



Development of a biomass-gasifier-based crematorium

In India, fuelwood continues to play an important role in both the domestic and industrial sectors. Cremation, the traditional burial practice of Hindus, is a major fuelwood-consuming activity. It is estimated that the annual consumption of fuelwood for cremation alone is about 5 million tonnes. Often, due to scarcity of fuelwood, a large number of underburnt dead bodies are thrown into the rivers, causing considerable water pollution.

Under a project sponsored by the Ministry of Non-conventional Energy Sources, Government of India, TERI has successfully developed and tested an efficient and eco-friendly gasifier-based crematorium. After successful laboratory trials at TERI's Gual Pahari campus, the prototype system was installed at Ambernath (Maharashtra) in March 2002. With assistance from the Ambernath Municipal Corporation and the Nagarika Seva Mandal, field trials were carried out successfully and, on 31 July 2002, the system was formally put into use. The fuel consumption in the gasifier-based system was about 100–150 kg per cremation as against 400–600 kg in conventional cremation. Also, unlike electric crematoriums, the gasifier system is likely to gain more cultural and social acceptability. Due to lower capital cost (0.5 million rupees per unit as compared to electric or diesel crematoriums, which cost over 2 million rupees and substantial fuel-saving potential, this system holds enormous promise for India.



Gasifier-based crematorium developed and demonstrated by TERI at Ambernath in Maharashtra, India

In another significant development, the year saw the Division undertaking technology demonstration projects outside India. An improved gasifier-based biomass furnace, which halves the fuel input for burning rice husk, was developed successfully for rice mills in Bangladesh. Negotiations are under way to transfer this technology to units in Vietnam and Myanmar.

Under the Solar and Wind Energy Resource Assessment initiative of the United Nations Environment Programme, the Division is involved in developing global, regional, and national solar and wind resource maps on the Geographic Information System framework, transfer of the resource data and tools required for use in pre-investment operations, and use of these tools in national energy planning. The project involves 13 countries in the pilot stage: Bangladesh, Brazil, China, Cuba, El Salvador, Ethiopia, Ghana, Guatemala, Honduras, Kenya, Nepal, Nicaragua, and Sri Lanka. TERI is the regional coordinator, in collaboration with seven international institutes.

The Division is also helping the Haryana state government to improve Gurgaon's urban environs, by developing sustainable building design plans integrating the concepts of energy conservation, energy efficiency, and renewable energy utilization. Besides, it is also engaged in developing baselines for renewable energy projects under the clean development mechanism for the Government of India. On the product development front, the testing of the first prototype of a low temperature, multi-stage stack desalination system for rural and industrial applications has been initiated.

The Division is also active in the challenging area of managing solid and liquid wastes in urban and rural areas. It tries to provide feasible technological solutions and management alternatives. With the support of one of the largest corporate groups in southern India, the Division has initiated a project to develop an environmental management and rejuvenation plan of a river in Tirukkurungudi in Tamil Nadu, for which scientific qualitative evaluation has already been carried out. Once completed, this community-based sustainable model would serve as an example of an eco-village, with efficient resource utilization and improved quality of life.

The Division's research team working in the area of separation membranes earned laurels this year by demonstrating a superior purification process for making sugar that gives better juice colour and higher

purity than conventional techniques, and holds the promise of producing sulphur-free, refined quality sugar directly from hot sugar cane juice. For the second time in a row, the researchers working on this project bagged the prestigious Noel Deer Gold Medal (instituted by the Sugarcane Technologists Association of India) for their work in this field. Activities targeted at efficient water use, emphasizing waste water reclamation and reuse options in various industrial sectors, were also initiated in 2002/03.



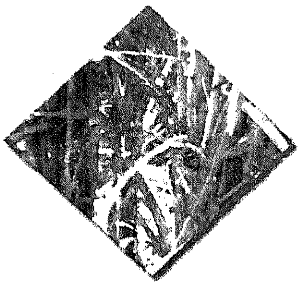
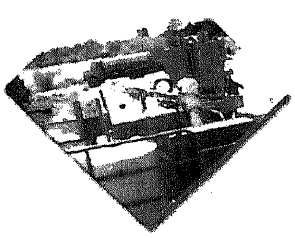
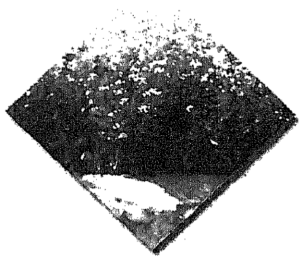
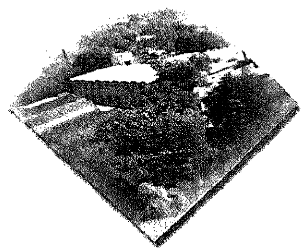
Glass: gas-fired muffle furnaces in Firozabad

With energy and resource scarcity threatening to become even more pronounced in the years to come, the focus of the Division in 2003/04 would continue to be on the development of cleaner technologies. This will be accomplished through research, promotion and mainstreaming of in-house technologies, and popularization of other technologies through holistic interventions for effective social and ecological change.

Bioresources and Biotechnology Division



- Centre for Mycorrhizal Research
- Microbial Biotechnology
- Plant Biotechnology
- Plant Tissue Culture and Molecular Biology

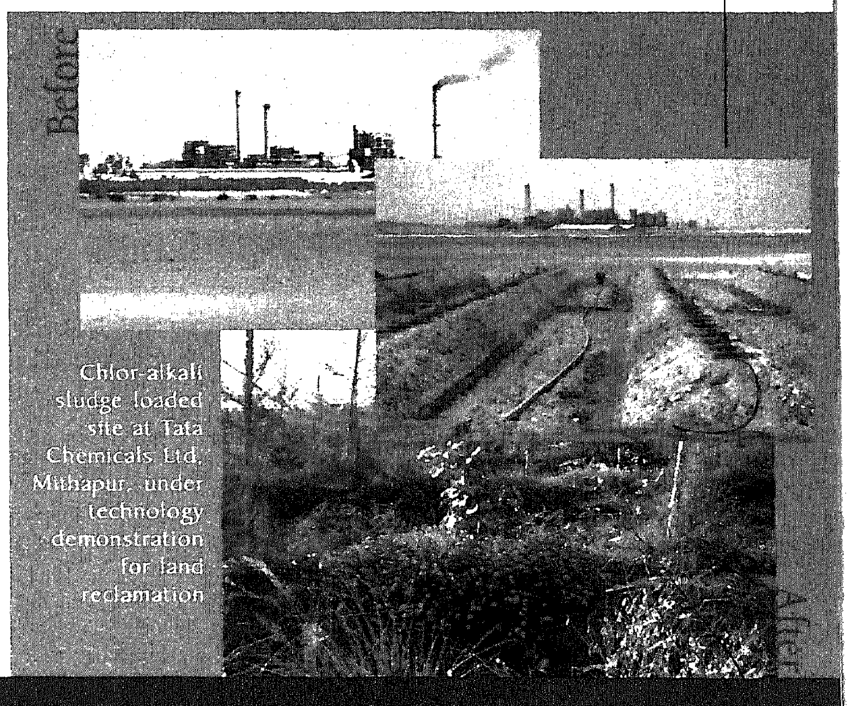
Visit our web site <www.teriin.org>

Bioresources and Biotechnology Division

India's biotechnology industry is at the threshold of tremendous growth. The industry promises to soon touch every aspect of our lives through its rapid developments. TERI's Bioresources and Biotechnology Division is geared to catalyse this process and make its mark felt in this biotech boom with ready-to-use and commercially viable products that are consumer-friendly, cost-effective, and environmentally sound.

In 2002/03, the Division's experienced workgroups accomplished milestones that received national and international accolades. Working in diverse fields, they

- applied *in vitro* techniques to supplement conventional methods for cloning of superior germplasm;
- demonstrated the superiority of tissue-culture-raised plants in the field to ensure quality control and cost-effectiveness;
- established techniques for crop protection by incorporating disease resistance;
- undertook biochemical prospecting of plant species for pesticidal and medicinal properties;
- applied biotechnological tools to augment conventional methods for incorporating traits for nutritional improvement in crop plants;
- developed a complete package of practices for reclamation of ash ponds through use of mycorrhiza;
- provided intensive and extensive training to scientists, entrepreneurs, and farmers/growers;
- demonstrated integrated pest management packages and new plant varieties at farmers' fields;
- developed microbial enhanced oil recovery technology for enhanced oil production from oil wells;
- developed and commercialized internationaly accepted products – Oilzapper and Oilivorous-S (in collaboration with the R&D Centre of the Indian Oil Corporation Ltd) – for bioremediation of crude oil spills and treatment of oil sludge; and



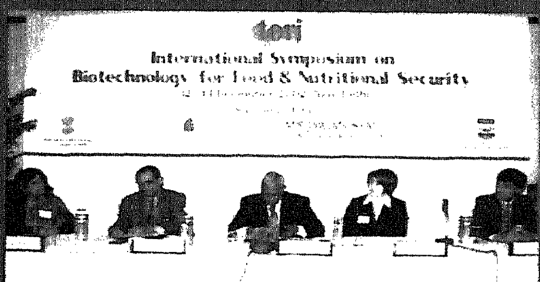
Chlor-alkali sludge loaded site at Tata Chemicals Ltd, Mithapur, under technology demonstration for land reclamation

Food for thought

Biotechnology has made it possible to design crops according to one's needs. Supported by the Department of Biotechnology (Government of India), the National Academy of Agricultural Sciences, the Michigan State University, and the United States Agency for International Development, TERI organized a symposium in New Delhi on 12 and 13 December 2002. A galaxy of eminent speakers, policy-makers, and decision-makers from the industry attended.

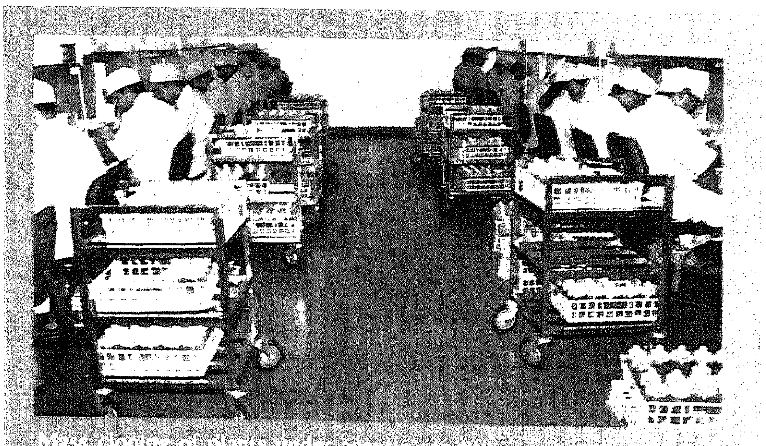
The deliberations reflected that the process of crop selection is age-old. Selections were earlier based on agro-morphological characteristics and, with some understanding of genetics, it was possible to choose the parent and produce offspring with desired traits of the selected parents. With advancements in tissue culture, it was possible to breed crops where there were barriers in terms of viable seed formation. The rare hybrids could be raised to maturity through application of plant tissue culture. Further understanding of genetics has made it possible to identify genes responsible for particular traits, isolate them, clone them, and insert them into another organism, which may be totally unrelated.

Accordingly, discussions were held on the promises offered by biotechnology as a means of food security; it is felt that genetically modified crops can sustain farming in marginal areas and restore degraded lands. Presentations were also made on the usage of genetic engineering for nutritional enhancement, the development of golden mustard intervention plan and strategies, and the facilitation of effective reach to target consumers and involve stakeholders.



❖ developed mycorrhiza biofertilizer *in vitro* mass inoculum production technology for application in chemical fertilizer curtailment, plant survival in stress conditions, and land reclamation.

The Division facilitated large-scale production of superior quality planting material of various economically important plant species. During the year, 1.6 million tissue-cultured plants of various forest trees, fruit crops, vegetables, cash crops, and ornamentals (both foliage and flowering species) were dispatched from TERI's Micropropagation Technology Park (in Gurgaon, Haryana) to different forest and horticulture departments, NGOs, agro-based companies, nurseries, private growers, and farmers. This boosted the total despatch figures from TERI's production facility till date to over 11 million tissue-cultured plants. The Division can undertake mass production of over 75 different species. The year's success has encouraged the researchers to investigate the production of other species such as apple, walnut, bamboo, and medicinal plants.


Mass cloning of plants under aseptic conditions

TERI's satellite centre in Guwahati (Assam) has helped consolidate the Division's activities in India's north-east. Established to popularize tissue culture and cater to the demand for superior quality planting material, the centre supplies local species such as citrus, vanilla, and turmeric. It organized a five-day workshop in December 2002 to train local officials of the agriculture, horticulture, and forest departments in the concepts and techniques of plant tissue culture.

Plant genetic engineering is an emergent field in India and can make a significant contribution in enhancing crop yields and nutritional quality. The Division is working to develop a transgenic variety of *Brassica juncea* (mustard) with high levels of beta-carotene (pro-vitamin A). This technology is expected to make a significant contribution in combating Vitamin A deficiency among economically weaker sections of the Indian society. Efforts are also on to develop transgenic papayas that are resistant to the papaya ringspot virus.

Plant biotechnology has been TERI's core expertise since the late 1980s, when the Division undertook a programme on genetic enhancement of oilseed *Brassica* (rapeseed–mustard). The ideal oilseed should be low in erucic acid, high in oleic acid (desirable for longer shelf life), and low in glucosinolates (desirable in oil cakes that are used as animal feed). Several improved quality strains of rapeseed–mustard have been developed, registered at the Indian council of Agricultural Research, and contributed to the National Agricultural Research System by TERI. This will have improved health benefits. The Division is also engaged in developing Indian mustard varieties with resistance to fungal diseases.

Increased yields from the available land require efficacious crop protection against pre- and post-harvest losses. The challenge is to do this without harming the environment or depleting the resource base. IPM (integrated pest management) is an important principle on which sustainable crop protection can be effectively based for solving ecological and health problems posed by synthetic pesticides. Practices for preventing pest damage in IPM include inspecting and monitoring crops for damage; using mechanical trapping devices, botanical pesticides, natural predators/parasites, and insect growth regulators; using mating disruption substances; and, if necessary, using chemical pesticides only based on need and sound judgement. IPM modules with biopesticides such as *Trichoderma*, *Trichogramma*, and *neem*-based pesticides as pest control measures were designed and demonstrated

Beyond brass tacks

As a result of decade-long research, TERI's scientists have developed several early-maturing, Canola-quality strains of *Brassica napus* (gobhi-sarson). Among these, the strain 'TERI Uttam' has shown enormous potential under the multilocation testing of the All-India Coordinated Research Project on Rapeseed–Mustard undertaken by the Indian Council of Agricultural Research. It is not only nutritionally superior but also has high oil content and matures earlier (within 135 days) as compared to conventional varieties, which take 150–160 days to mature. Due to early maturity and shattering tolerance, it will be well-suited to grow in mustard-growing areas. Its yield is 20% more than the *B. napus* National Check variety GSL-1. The presence of high oleic acid in the seed oil gives it better shelf life. Having made significant contributions to the genetic enhancement of *B. napus*, the Division is now concentrating its efforts on quality improvement of *B. juncea*, the most popularly grown oilseed species in India.

Several low erucic acid and high oleic acid Indian mustard lines have been developed. Work is being undertaken for combining the low erucic acid and low glucosinolate lines of *B. juncea* to evolve 'double low' varieties. Apart from quality, the quantity is equally important. Under unfavourable environmental conditions, fungal diseases may cause yield losses up to 60%. Therefore, work is also on to incorporate resistance to fungal diseases, white rust, and alternaria blight in mustard lines, thus making for better yields.



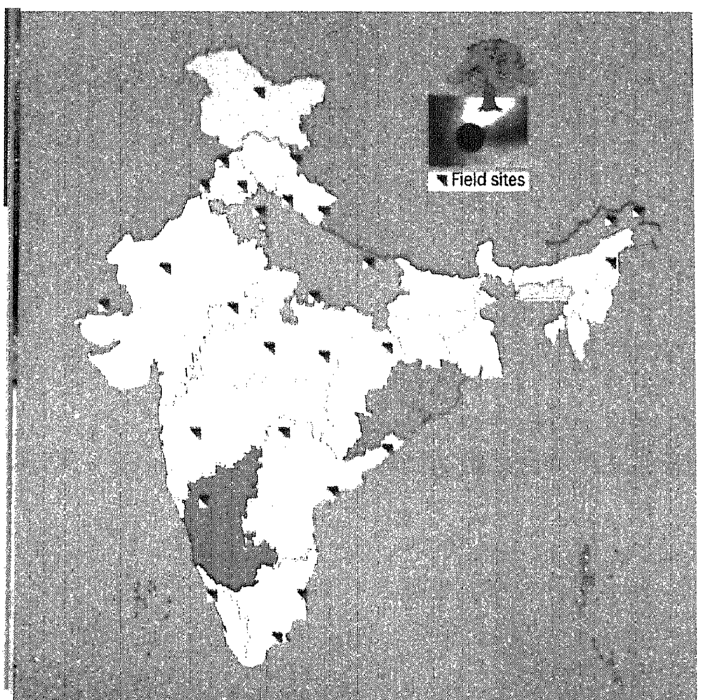


by TERI for paddy and sugar cane in five villages of Haryana. The interventions helped reduce pesticides in the environment and food and increase yields and, thereby, incomes.

The Division is also actively involved in bioprospecting of biodiversity for newer, environmentally safe pesticides. This involves the identification of new bio-molecules through bioassay medicated screening of plant extracts/fractions and development of their formulations. Efforts in this direction have helped identify plant species with pesticidal properties against *Helicoverpa armigera*, a pest that affects many economically important crops such as cotton, pulses, and vegetables. The second approach under this activity is chemoprofiling of medicinal plants for active principles. Many ecotypes of *neem* (*Azadirachta indica*), containing over 1% azadirachtin and over 50% oil content, have been identified.

Mycorrhiza is now becoming synonymous with sustainable plant production, particularly for nutritionally poor and environmentally threatened sites across the world. TERI's research on mycorrhiza was initiated as early as 1986. The focused approach yielded many innovative technologies, a major germplasm repository, and demonstrated results, across the country and overseas, towards economic and soil fertility gains by the farmers.

While dealing with environmental pollution, several problems like fly ash dumps, effluent contaminated soils, and excessive inorganic sludge from chemical industries were addressed successfully. The technologies are now demonstrated and the multiplier effect of the achievement is slowly gaining ground. All these efforts maintain a cutting edge over conventional technologies in terms of being economically attractive and viable and capable of restoring environmental damage and combating health hazards.



Multi-location field trials for mycorrhiza potential demonstration

Hard-pressed in the changing scenario of reduced subsidies and increased competition, the marginal farmer is now looking towards sustainable solutions. The Division has made headway in achieving sustainable plant production, by significantly reducing inputs of chemical fertilizers. Appropriate application technologies have been successfully demonstrated (alleviating concerns over the cost–benefit ratio) and soil fertility has improved overall. TERI is already way ahead in integrating nutrient management with organic agriculture and commercialization of mycorrhiza.

Recipient industries of this technology have drawn substantial advantage from TERI's handholding; this unique relationship between a research institute and the industry has made the

product available to consumers on a large scale. Based on the demand, the industry is committed to increase production capacity further, reiterating TERI's achievements in selecting appropriate material and technological innovation. Dr Murli Manohar Joshi, Hon'ble Minister for Science and Technology, Human Resource Development, and Ocean Development, Government of India, launched the product on 'Technology Day' (11 May) in 2002.

Under several ongoing projects, such as selection of mycorrhiza for wheat–rice and wheat–pulse rotation, TERI will soon be releasing a product specifically for these cropping patterns. International support has also been sought in selecting mycorrhizal isolates for heavy-metal-contaminated sites. The Division endeavours to target specific environmental problems in the near future. The global mycorrhizal network, headquartered at TERI for the last 13 years, caters to the needs of researchers by providing them with updated information, facilitating training, and providing access to specialized databases.

The Division exploits the biotechnological potential of natural microorganisms, through the development and use of eco-friendly technologies, for producing energy and controlling environmental pollution. It has developed and successfully commercialized two microbe-based products – Oilzapper and Oilivorous-S – for the bioremediation of crude oil spills and bio-treatment of oily sludge (hazardous hydrocarbon waste generated by oil refineries). After six years of research sponsored by the Department of Biotechnology, the Government of India, a bacterial consortium called Oilzapper was developed by assembling five naturally occurring bacterial species that can biodegrade different types of oily sludge and crude oil. Capable of mopping up crude oil spills, the Oilzapper has proven a success with the petroleum industry.

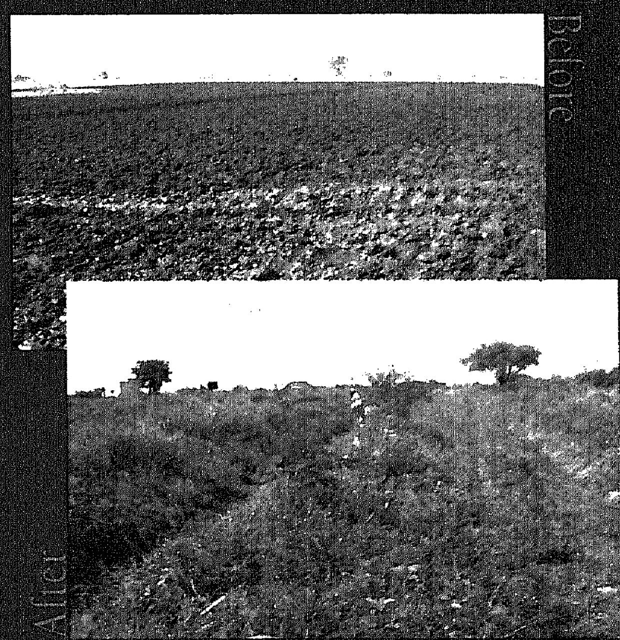
The Division is also engaged in a microbial biodiversity assessment programme for the creation of a referral centre for microorganisms that could biodegrade various toxic hydrocarbon compounds and desulphurize fuel oil. It has undertaken a programme to assess and catalogue microbial diversity at sites contaminated with crude oil, using molecular biology tools.

A slick remedy

Oilivorous-S is an improved biotechnological means for more efficient oily sludge degradation developed jointly by TERI and the Biotics Department of the Research and Development Centre of Indian Oil Corporation Ltd. Application of Oilzapper and Oilivorous-S has helped bio-treat more than 15 000 tonnes oily sludge; another 5000 tonnes is currently under treatment at various oil refineries. Both products have received wide recognition as can be gauged by the requests received from organizations in Canada, China, Kuwait, Malaysia, Pakistan, Saudi Arabia, and the US to name a few.

The Oilzapper/Oilivorous-S technology for treatment of oily sludge and clean-up of oil spills is currently being used by the following organizations.

- Indian Oil Corporation Ltd
- Bharat Petroleum Corporation Ltd
- Hindustan Petroleum Corporation Ltd
- Oil and Natural Gas Corporation Ltd
- Oil India Ltd
- Indian Petrochemicals Corporation Ltd.



Site contaminated with distillery effluent under mycorrhiza technology demonstration

Well begun...

Ageing of oil wells is a perpetual problem that the oil industry faces. Once approximately 40% of the oil is recovered from an oil well, it becomes 'sick'. This happens because oil is associated with natural gas. It is the gas in the reservoirs that initially helps in pushing the oil up to the mouth of the oil well. As extraction continues, the gas in the reservoir diminishes and the pressure it creates decreases. This leads to a decline in oil flow; eventually, a point is reached after which oil production from the oil well stops. Porous rocks in the oil reservoir retain most of the remaining oil. Getting the oil out of these porous rocks is not easy. TERI's scientists tackled this problem through methodical research, leading to the development of a technology for enhanced oil recovery from sick oil wells by using microbes.

The technology, popularly known as microbial enhanced oil recovery, involves the injection of thermophilic (heat-loving), barophilic (pressure-loving), and anaerobic bacterial consortia into sick oil wells. The bacteria proliferate in the reservoirs for 15–20 days and produce polymers, gases (carbon dioxide and methane), and organic acids, which act on the pores in the rocks containing oil, squeezing it out.

Scientists at TERI and the Institute of Reservoir Studies, Oil and Natural Gas Corporation Ltd, Ahmedabad, have developed the bacterial consortium, which helps recover crude oil from sick oil wells. The anaerobic bacterial consortium was produced in bulk and injected into 12 oil wells. Oil production in these oil wells increased from 10% to 170%. The technology is being validated and will be commercialized shortly.



To further the research into finding a biotechnological solution for oil recovery from poorly-productive or sick wells, the Division collaborated with the Institute of Reservoir Studies, Oil and Natural Gas Corporation Ltd, Ahmedabad, to develop a thermophilic (active at 90 °C), anaerobic bacterial consortium for application in a tertiary oil recovery process. Tested for enhanced oil recovery in 15 wells at Kalol and Mehsana oilfields in Gujarat, this consortium gave 25%–300% enhanced oil recovery. It is currently under testing in 10 other wells in the same region. Isolation and characterization of individual strains and assessment of their potential for microbial enhanced oil recovery is under way.

Many problems in the petroleum industry are currently being solved using microbial remedies. The Division has isolated efficient bacterial strains for removing paraffin from oil wells and developed suitable inoculants. In addition, with financial assistance from the Swiss Agency for Development and Cooperation and the Department of Biotechnology, Government of India, it has initiated a programme for selecting bacterial strains for bioaugmentation of pesticide-contaminated soil with special emphasis on endosulfan in tea plantations.

Another emergent programme is the production of an environment-friendly alternative fuel. Bioethanol production from fruit and vegetable waste and starchy raw material using *Zymomonas mobilis* and an indigenous strain TERI-110 is being undertaken. A co-culture-based and bi-phasic fermentation process is under development, along with the production of microbial hybrids for efficient utilization of pentoses and hexoses. Work on production of succinic acid from glucose by using selected efficient anaerobic bacterial strains is currently under development.

The strides made by the Division's different workgroups in their respective fields of biotechnology are the rungs of a road map that TERI is about to chalk out in the national scenario—a unique capacity building initiative that will provide environment-friendly technologies and solutions to consumers and growers alike.

Well over a century ago, when he wrote the enduring lines 'The old order changeth, yielding place to new', Lord Tennyson captured the uncertainty of an increasingly scientific age. Today, the world alters even faster, the 'new' yielding to the futuristic. Technologies and ideologies emerge and fade but central through all this remains the individual: originator, victim, beneficiary of change...

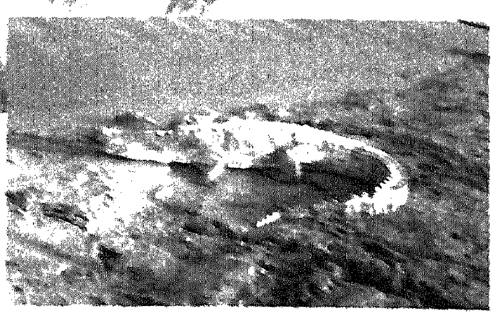
South Asia's turn-of-the-century flux, with its liberalizing markets and fluctuating currencies, has witnessed increasingly effective private sector participation in infrastructure service delivery. Developing-world governments are transcending the role of owning/operating infrastructure to focus on regulating the service providers.

Indeed, an important aspect of governance now is to ensure fair and competent implementation of reform so as to maintain an effective balance of interest among governments, customers, and investors to boost the economy. Several specialist agencies to regulate the economic, technical, and customer service performance of infrastructure operators have been formed in the recent past and many others are firming up.

At the same time, on the development front, India is experimenting with a variety of decentralized and participatory forms of governance. Constitutional Amendments 73 and 74 have provided much greater powers to urban local bodies and to the Panchayati Raj institutions to manage their natural resources and other factors of production. Increasing emphasis is being placed upon new forms of governance through community-based mechanisms such as self-help and user groups. In keeping with global trends, transparency and citizens' right to information have been given legal status.



A rhinoceros in the grasslands of the Dudhwa National Park in Uttar Pradesh, India



A gharial in the Katerniaghat Wildlife Sanctuary

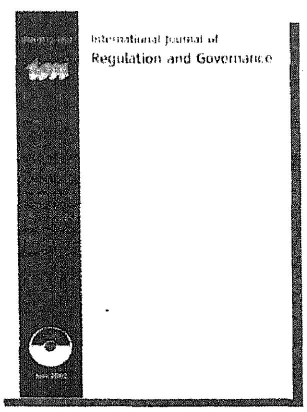
Conceptualized in the late 1990s to facilitate the strengthening of new and emerging forms of governance and regulation of economic and natural resource systems, TERI's Regulatory Studies and Governance Division has

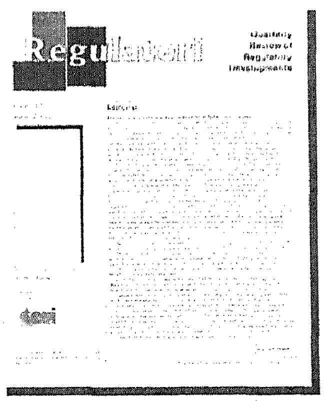
- helped design effective regulatory systems—a complex task involving rules, instruments, regulatory entities, policy objectives, industry characteristics, and country-specific conditions;

- facilitated community involvement in decision-making and in bringing about greater accountability;
- designed and implemented innovative financing mechanisms to address the special needs of the poorer segments of society; and
- promoted market-based instruments for better governance.

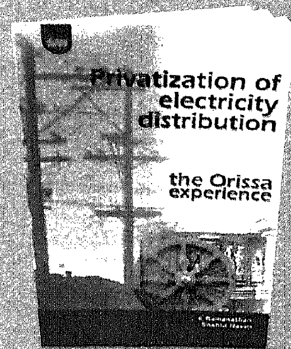
The year 2002/03 was indeed one for transcending. The Division moved on from initiating or facilitating reform (through assistance in tariff structuring, demand forecasting, economic valuation, and entrepreneurship development) into the realm of consolidation by delving into the finer points of consumer satisfaction and service quality. Particular attention was paid to the impacts (on the consumers) of implementing the attributes of better governance: transparency, accountability, participation, access, and so forth.

The Division helped create a considerable literature base through deliberations in various forums and dissemination of information and research results through its print and electronic publications. The *International Journal of Regulation and Governance* is a globally respected biannual publication providing comprehensive investigation, analyses, and reviews confronting decision-makers, planners, consultants, and researchers in the energy, telecommunications, water, environment, and transport sectors. (Visit <www.teriin.org/online/ijrg/>.) The Division also puts out *Regulateri*, a quarterly newsletter with updated information and insightful analyses on Indian, South Asian, and global regulatory developments.





Privatization of electricity distribution: the Orissa experience



Following the economic reforms launched by the Government of India in 1991, Orissa was the first state in India – in fact also in South Asia – to open up the state-owned electricity industry to private sector participation. It was expected that, with the privatization of electricity distribution, the ailing power sector in the state would turn around for better and serve as a model for other states to follow. However, the results have belied many expectations and raised a number of issues.

The Division has documented the privatization experience in Orissa and brought it out in the form of a book in 2003. Starting with the reform context, the comprehensive but concise account goes through the process and strategy for privatization to the post-privatization scenario. Consciously avoiding being judgemental, the study is scrupulously objective and analytical. The account offers an insight into the various nuances of a privatized environment, from the points of view of both regulators and consumers. These can be taken as lessons by other states of India and also by other countries in the region that are in the process of reforming their power sectors.

The study has also highlighted the need for state-specific models and approaches for the privatization of electricity distribution. The National Capital Region of Delhi has already adopted a different approach and some other states are also considering alternative models. The book discusses some of the salient features of these models as well.

The publication is certainly a useful addition to the literature on power sector reforms, providing enough food for thought to policy-makers and researchers working on the implications and future of electricity reforms in developing countries.

A time to plan: strategizing biodiversity conservation

The Division devised strategies and actions to enhance conservation, effective governance, and sustainable utilization of biodiversity in the north Indian states of Uttar Pradesh and Uttaranchal. A mammoth exercise was carried out – involving a range of stakeholders – to document the biodiversity states of the two states. The project team studied the gamut of issues pertaining to biodiversity and protected area management: biological parameters; socio-economic and community considerations; and legal, policy, and governance matters. The idea was to develop comprehensive plans that would eventually lead to the integration of biodiversity concerns with all facets of state-level policy and planning, ensuring cross-sectoral participation.

The biodiversity governance study identified ecosystems and habitats of conservation value in the states, and assessed the adequacy of conservation management plans and practices, approaches to regional planning, and development activities for biodiversity conservation. The study covered both protected and non-protected areas including forests, freshwater and other wetland systems, important avifauna wintering areas, and agricultural and landscape systems. The status and effectiveness of current programmes of *ex situ* conservation were also determined. Management and policy aspects of the study included the following.

- Analysis of the capacity of institutions (government and NGOs) in relation to planning, management, and regulation of biodiversity conservation
- Analysis of the impact of regional development programmes on ecosystems and species
- Study of the effectiveness of laws and regulatory measures pertaining to conservation and sustainable utilization of biological resources
- Study of policies that directly or indirectly affect the status and conditions of biodiversity
- Analysis of enforcement measures for successful prosecution of offences
- Coordination between enforcement agencies.



River Girwa in the Katerniaghat Wildlife Sanctuary

A *bugyal* (meadow) in the Kedarnath Wildlife Sanctuary



Apart from this, some major networking initiatives taken by the Division this year included international conferences on oil and gas security (measure and response mechanisms) and electricity deregulation, training workshops on Internet resources on infrastructure regulation and on sustainable development of the power sector, and the development of a training module on infrastructure deregulation under a project sponsored by the United Nations Development Programme.

The Division's focus on governance was boosted with the inclusion of two new workstreams, dealing with (1) forestry/ biodiversity and (2) rural energy. Through these new functional areas, the Division attempted to address itself to governance for natural resource management and the provision of grid-based/renewable energy at decentralized levels as well as governance for traditional economic sectors through the introduction of independent regulatory bodies.

While the Division's visibly rising proficiency attracted several eminent faculty members from across the world, the networking on infrastructure reform was facilitated primarily through the SAFIR (South Asian Forum for Infrastructure Regulation) network. Launched in 1999 to provide focused learning and experience-sharing opportunities for infrastructure regulators in South Asia, SAFIR conducts

regular regional training programmes with TERI providing technical and administrative support. The objective of SAFIR is to provide exceptional training, stimulate relevant research, and facilitate beneficial exchange and implementation of global best practices. The most recent in this series was the Fourth Core Training Course on Infrastructure Regulation and Reform held from 15 to 23 September 2002 in Goa, India. SAFIR also has a regular newsletter and dedicated Web-based resources.

Participants from SAFIR's events have recently formalized their network by creating a membership-based association. (Log on to <www.safir.teri.res.in> for details.) In endeavouring to build regulatory capacity and networks, it amplified its focus beyond India and the South Asian region to encompass another critical mass of transitioning development—the African nations.

Some specific experiences of the Division are highlighted in the accompanying boxes. In the year to come, the Division will continue to consolidate its pre-eminence in the field of regulatory reform in South Asia through research,

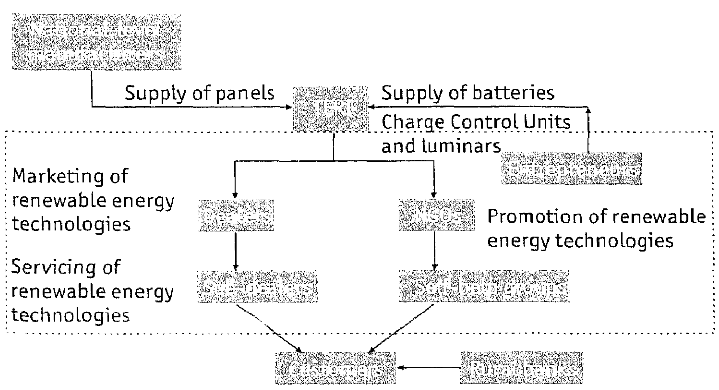
Promoting renewable energy technologies in rural India

The implementation of renewable energy programmes in India over the past two decades has brought up several pertinent issues. It is felt that government programmes alone cannot meet the vast energy requirements of rural India. Even with subsidies for various technology options, the initial costs remain high for a large base of potential users who are at the very bottom of the financial ladder. In addition, poor awareness regarding renewable energy options, lack of appropriate services and maintenance back-up, and almost non-existent financing/credit facilities for the rural people further hinder the cause of promotion of RET (renewable energy technology) systems.

Given the above scenario, the Division undertook a project, supported by the India–Canada Environment Facility, to strategize a commercial approach for RET dissemination. The project initiated tie-ups with local/rural banks and other financial institutions to provide soft loans to rural people, with the aim of generating awareness among the rural community and training locals to create maintenance back-up facilities.

The project found that in order to have an effective approach for disseminating RETs, it was desirable to focus on technology customization through involvement of local entrepreneurs and the development of a network of local dealers and retailers, who not only offer technologies but also facilitate access to services such as credit and maintenance. Field surveys and market analyses revealed that solar photovoltaic systems used for lighting are good options for initiating the commercialization process.

The study further indicated that to go commercial, it is essential to bring the diverse agencies and institutions facilitating access to energy-related services onto one platform, instead of focusing only on technology or products. To that effect, the project developed and operationalized an Energy Service Network, comprising NGOs, local entrepreneurs, shopkeepers, and manufacturers, among others. The basic concept on the functioning of the network is indicated in the accompanying figure.



The Energy Service Network developed by the project

The network relates to resource organization, local manufacturing and assembly, training, mobilization of funds, and interfacing with stakeholders. In addition, assistance is provided to the rural communities to install, maintain, and repair RET products. The activities showed that such a conglomerate can be the anchor for RET dissemination in rural areas.

The project team realized that in any programme aimed at commercialization of a product, a brand name helps create a distinct image in the customer's mind. Hence, a brand name, like *Uttam Urja*, that literally translates as 'best energy', helped initiate and strengthen the process of commercialization.

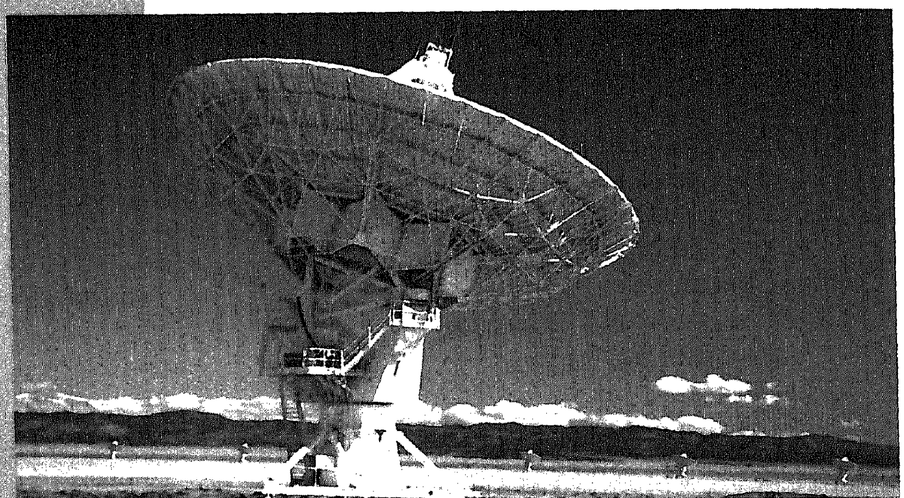
Effecting reforms in the telecom sector

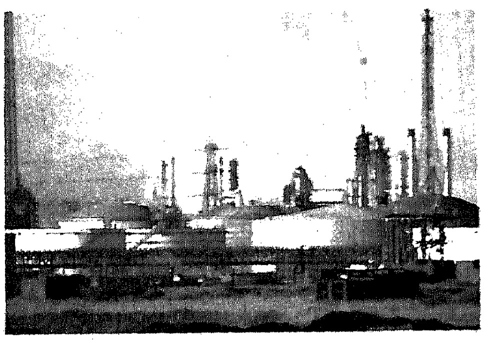
In 2002/03, TERI launched the Policy Discussion Forum Series—an initiative to identify key issues, opportunities, and thrust areas of national and international concern; widen the relevant knowledge base; and share views, perspectives, and experiences of different stakeholders, to arrive at a consensus.

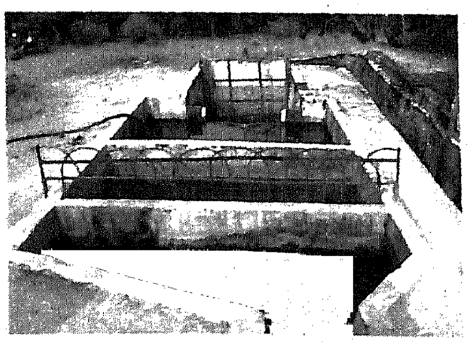
Using this platform to boost regulatory reform in India's infrastructure sectors, the Division organized the first roundtable discussion of the series on 11 March 2003, titled *Unified licensing framework in the telecommunications sector in India: the need and challenges*. Highlighting the need for a unified licensing framework in India's telecom sector, the deliberations focused on the challenges that such a move would pose before regulators as well as consumers. The discussion was attended by numerous representatives of the telecom sector, including TRAI (Telecom Regulatory Authority of India), the Cellular Operators Association of India, the Association of Basic Operators, Tata Teleservices Ltd, the Internet Service Providers Association of India, and academic institutions and independent experts.

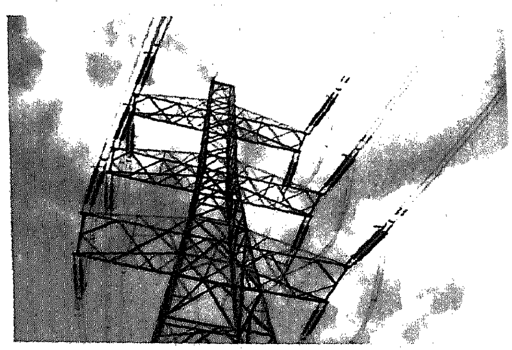
The discussion was followed by a talk by Mr M S Verma, Chairperson of TRAI, on the vision of the regulator for the telecom sector. Titled *A view on the future of telecom sector in India: Vision 2007*, the talk was based on the vision document for the telecom sector. Mr Verma highlighted the regulatory preparedness to deal with future sectoral developments. Technical incapability often proves a hurdle in implementing new regulations at short notice. As part of the vision, increased industry participation in regulation has been urged. Also, an industry forum could be set up to take the lead in standardization, consumer coding, and interconnection. On the whole, the talk emphasized that while India has the necessary potential and certain positive currents on its side, it must also observe caution and avoid the mistakes committed by the developed countries.

advisory services, capacity building, and networking. It expects to play a greater role in the dynamic and challenging aspects of regulatory reform in the energy, telecommunications, and infrastructure services. It hopes to focus on issues of governance of natural resources and infrastructure sectors in the context of the national and global policy goals of achieving better living conditions and facilitating services for the poor.

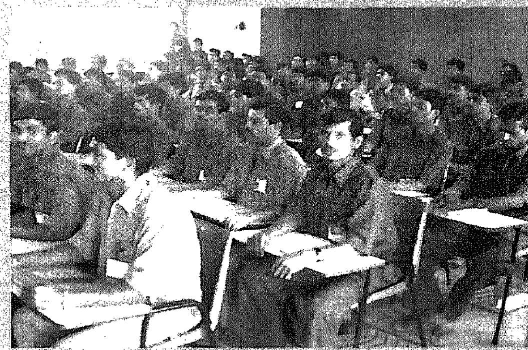








The efficacy of urban governance often gets undermined by the inadequacy of information available to decision-makers to enable them to make visionary decisions about tariffs, service levels, capital investments, overall transport policies, and so forth. In view of this, the Bombay Provincial Municipal Corporation Act (1949) mandates that all municipal corporations in Maharashtra should submit an Annual Subsidies Report at the time of presenting the municipal budget. The Division – with its experience and expertise manifested in economists, planners, and public policy experts – took up the task to estimate subsidies in public transport operations for the Thane Municipal Corporation. Based on its analysis, the Division developed strategies for municipal corporations to reduce their subsidy burdens. These include recommendations on changes in policy, institutional and regulatory arrangements, steps for improved financial viability of the sector, and strategies for increasing efficiency.



Training of employees of the Thane Municipal Transport Undertaking on manpower efficiency improvement

The study found that stakeholder ownership was critical to the successful implementation of the suggested reform strategy. To ensure this, the process was consultative and the local body was advised to establish a consensus. The Division held extensive consultations with communities and stakeholders in the sector, particularly the TMTU (Thane Municipal Transport Undertaking) and the Transport Committee. Discussions were also held with the Municipal Commissioner. This was imperative, given that the sector is socially and politically sensitive. This enabled the project team to discuss the changes in the TMTU's role, its ability to adapt to changing circumstances, and its response to external and internal pressures. The extensive expertise that the Division brought to the project also provided a wider perspective on several other issues facing the sector.



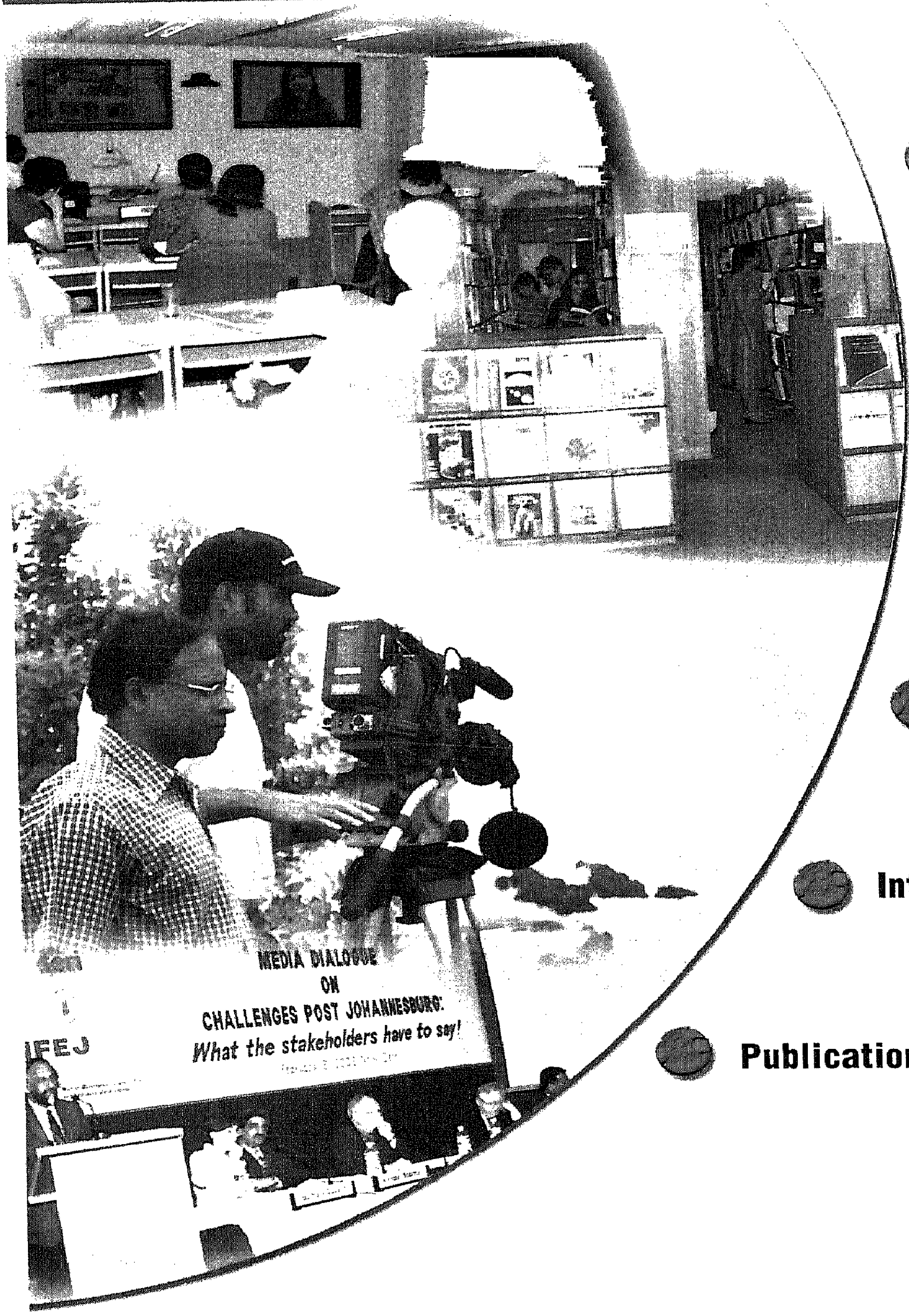
Improper route planning and competition for passengers among various transport modes



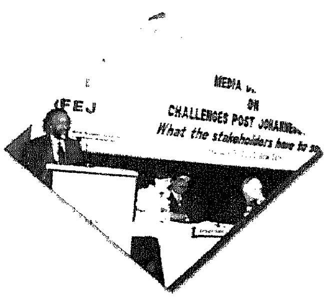
A critical link was established for dialogue among agencies with expertise in specific service areas. Interviews were carried out with agencies such as the transport department and the employees' union. To ensure that the proposed changes were practical and acceptable, a draft framework was put up for discussion with policy-makers and stakeholders to elicit comments at various stages of the project. The feedback was incorporated before formulating the final recommendations. This ensured that the reform process had the support of the communities and the stakeholders.

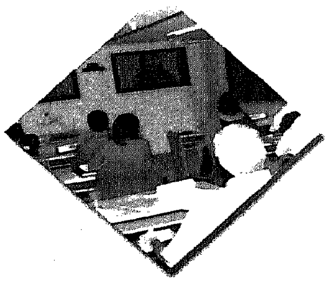
Taking the recommendations beyond the consultation stage, the Division actively pursued these with the municipal corporation. The recommendations were also presented to the Transport Committee, and the principles of reforms and the strategies outlined were accepted. Subsequently, the TMTU developed an action plan for implementing these. The Division is currently guiding the local body in implementing these strategies.

Information Technology and Services Division

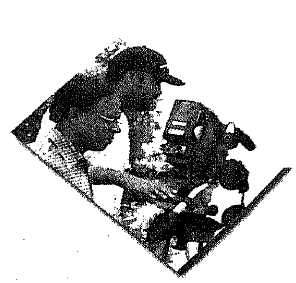


- Centre for Information Technology Applications
- Centre for Information Technology Infrastructure and Networking
- Communication Services
- Library and Information Centre
- Information Dissemination Services
- Publications Unit









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Information Technology and Services Division

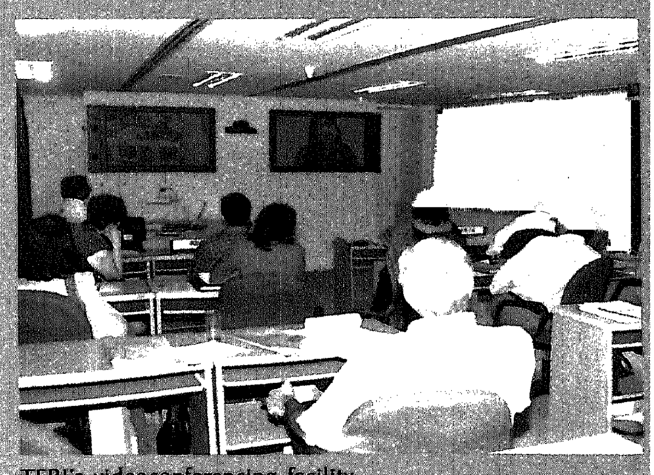
Delivering the right information, in the right form, and at the right time to those who need it the most—that is the challenge TERI's Information Technology and Services Division strives to meet everyday, powered by state-of-the-art technologies and strategic outreach activities. The Division communicates with and disseminates effective, expeditious, and value-added information to researchers, policy-makers, administrators, technocrats, and scholars through a variety of media—print, television, Internet, video, and CDs.

Harnessing modern tools

TERI's state-of-the-art IT (information technology) infrastructure has effectively enhanced the institute's productivity and helped it achieve the distinction of being 'information-rich'—one among the few institutes from the developing world that deploy IT extensively in research, information processing, communication, outreach, and administration. TERI operates with world-class IT networking infrastructure, a wide area network with regional centres, a high-speed Internet leased line, and indigenously developed ERP (enterprise resource planning) and KM (knowledge management) systems. Further, 24 × 7 networking services provide users complete access to these resources—anytime, anywhere.

In 2002/03, the Division focused on upgrading the existing hardware and software infrastructure in tune with global technological change. It deployed high-powered desktops and notebooks, thin servers, a large capacity storage device with a dedicated server, and a high-end plotter. It initiated net meetings and videoconferences with TERI's regional centres through a 64 kbps point-to-point leased line and an Integrated Services Digital Network, respectively. Point-to-point connectivity is also being utilized effectively for sharing ERP, Intranet, and KM applications with the implementation of Citrix Metaframe at the headquarters in New Delhi.

Last year, the Division also launched its state-of-the-art videoconferencing system, which has been recognized as a DLC (distance learning centre) of the World Bank's Global Development Learning Network. Fully equipped with multimedia and videoconferencing facilities, the



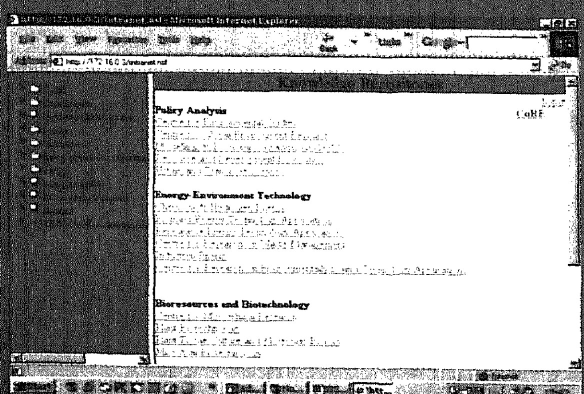
TERI's videoconferencing facility

Knowledge management at TERI

As knowledge comes to rule the global economy, TERI realizes that the intellectual capital of an organization plays a crucial role in broadening its functional realities. The Division, therefore, effectively harnesses the valuable knowledge that the institute accumulates through research and actions, using modern information and communication technologies. It already has in place a KM (knowledge management) system that boasts of 23 knowledge repositories, apart from containing publications, project reports, presentations, and other useful documents. While the system is constantly upgraded and updated, in 2002/03, the focus was on making it more streamlined and integrating it with other processes such that the information flow is automatic, instead of being a forced one.

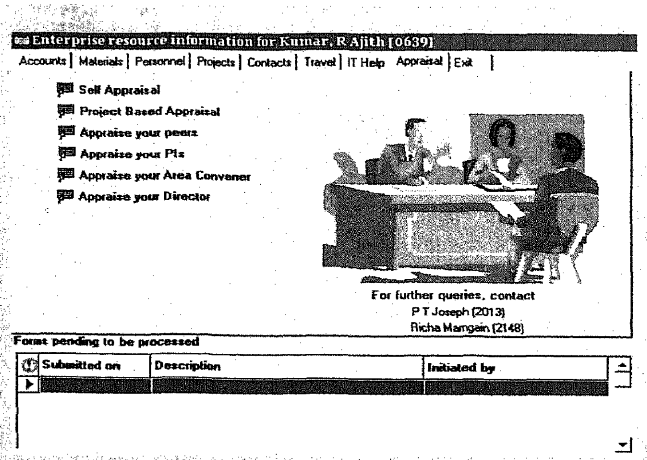
Two new knowledge repositories for areas in the Regulatory Studies and Governance Divisions were added to the KM system this year. A pre-proposal discussion forum was also operationalized to facilitate researchers to discuss ideas right at the concept stage so that they develop into well-thought-out, full-fledged proposals. Also, the addition of new features like global search and integration with the existing messaging system was explored to ensure proactive services.

To share experiences related to KM, and also to build the capacity of other organizations, TERI organized a workshop on *Strategies for Knowledge Management*. The workshop was attended by management professionals, decision-makers, and KM professionals from research/scientific, non-governmental, bilateral/multilateral, and government organizations as well as the corporate sector.



DLC provides web-based and multimedia training aids, facilitating simultaneous policy dialogues and roundtable discussions with many partners at different locations across the globe. In all, 14 sessions were held over the year, with eight DLC partners, on issues ranging from 'transparency in infrastructure concessions' to 'impact of ICT [information and communication technologies] on rural households'.

The Division continuously adds value to TERI's ERP system, in a bid to achieve seamless online operability, thus increasing efficiency while reducing resource use. In 2002/03, three new modules were added to the ERP's existing 20. The first, a Sales Module, has automated transaction handling, subscription, and membership management for TERI's information products and services. The second module, a



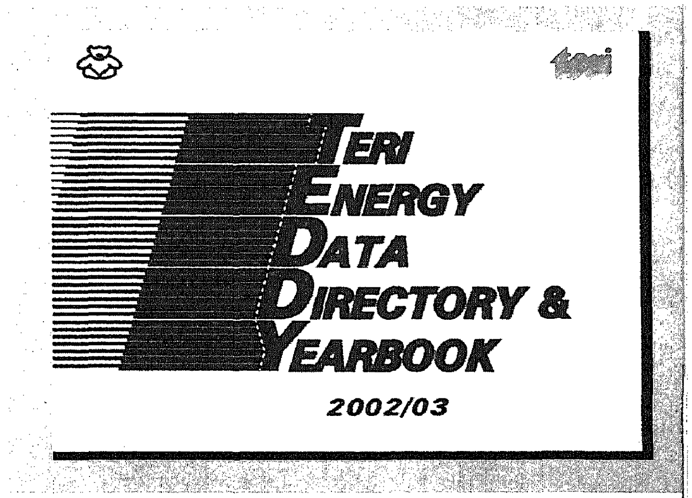
The TERI ERP gets a new look

Performance Appraisal System, has placed the employee appraisal process fully online and imbued it with a new dimension of dynamic interactivity and lucid transparency. [The system is linked with the institute's project monitoring system to automate and facilitate project-based appraisals.] The third module, a Professional Recruitment System, tracks and stores the status of applications for various positions in TERI; it is searchable by keywords. While functionality was the major criterion in the development of the modules, considerable attention was paid to the design of the user interface, in an attempt to improve visual appeal and usability.

The Division also administers TERI's KM system, which facilitates TERI in functioning as an organic whole. It is integrated with diverse searchable sources such as the ERP system, the Intranet, abstract databases, and news archives (*see Box*).

To exploit the versatility of the electronic medium, TERI's popular reference book – *TEDDY (TERI Energy Data Directory and Yearbook)* – was also published in CD format. Value-adding features of this product include a user-friendly interface, hyperlinks for easier navigation, and data tables in easy-to-use formats.

The Division made its foray into multimedia with its design and development of a corporate presentation highlighting TERI's diversified activities. E-learning activities were initiated by developing a self-learning CD module intended to train new incumbents on TERI's office applications and an interactive, educational module on vermicomposting for schoolchildren.

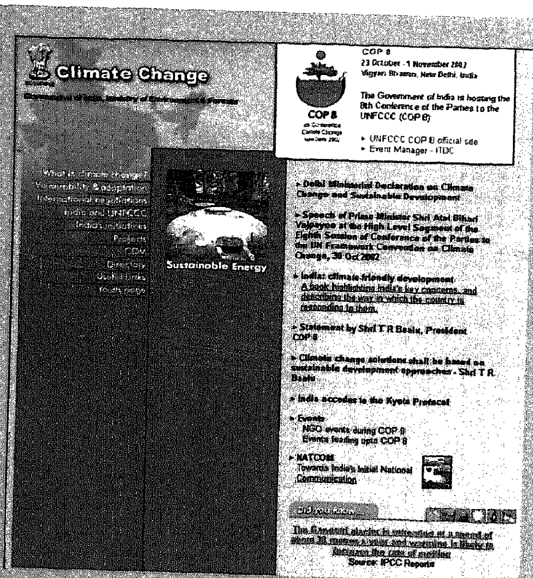


The Division continues to provide consultancy to India's Ministry of Statistics and Programme Implementation on the design, development, and implementation of its online computerized monitoring system, which will help the ministry effectively monitor all the government projects worth over 200 million rupees. A web site bundled with Extranet and Intranet; a content management system for the project's e-zine; audio-visuals; and multimedia self-training kits are some salient features of this project.

TERI's award-winning web site, which receives over 1 million hits every month, has been enriched with an online version of *Teriscope*, the institute's bimonthly newsletter, and a searchable catalogue of the TERI library. The subscriber base of the web newsletter has crossed 3000 users from around 50 countries and the site is now cross-linked to over 500 others.

The Division develops and maintains various project- and network-related web sites. EduGreen, the online resource on environment for schoolchildren, has been extended to Enviroclub, a membership-based, interactive platform for schools. As a precursor to CoP-8, (eighth session of the Conference of the Parties to the United Nations Framework Convention on Climate Change), TERI developed a web site <http://envfor.nic.in/cc/index.htm> for the MoEF (Ministry of Environment and Forests), Government of India. This facilitated access to comprehensive information on various aspects of climate change. By developing the ICTEAP (Information and Communication Technology and the Environment in Asia and the Pacific) web site <http://www.icteap.org/index.htm>, the Division has disseminated numerous regional success stories and failures – in the use of ICT – for other countries to gain inspiration or derive caution from.

Also, keeping step with the latest web-related developments, the Division redesigned the web sites of the Intergovernmental Panel on



Web site facilitated information on and for the eighth session of the Conference of Parties to the United Nations Framework Convention on Climate Change

Climate Change <http://www.ipcc.ch>, which it continues to maintain; the TERI School of Advanced Studies <http://www.terischool.ac.in>; and the South Asia Forum for Infrastructure Regulation <http://www.safir.teri.res.in>.

Sensitive to the importance of ICT as a key driver of socio-economic progress, the Division has also launched an ambitious endeavour to wire the grass roots. Aimed at empowering rural communities by providing access to relevant and valuable resources, the initiative will set up IT kiosks—replete with modern and affordable technologies, customized interfaces, and content in local languages—in remote areas, which are often marginalized in the increasingly knowledge-based society. Also, diversifying into content development for portals, the Division has created an information repository on rural energy for the India Country Gateway, in partnership with the Ministry of Information Technology, India.

Striding on to keep pace with advances in and trends of the global IT realm, the division has begun to explore the next generation of ERP and KM systems and open source technologies for future applications.

Augmenting knowledge

The Division maintains a pioneering research library, arguably South Asia's finest repository of readings on energy, environment, and sustainable development. The library holds over 18 000 books, reports, and conference proceedings; subscribes to 700 journals (with over 15 000 back volumes); and acquires close to 800 books and other documents annually. After bar-coding all the documents the previous year, user' identity cards were bar-coded in 2002/03, further streamlining and systematizing the functioning of the library.

The Division also offers CD-ROM collections of bibliographical and statistical information and Internet connectivity for accessing databases worldwide. Besides data collection and information analysis, the Division provides support services in the form of query resolution, document delivery, and reprography services and serves as a reference and referral centre.



TERI's carefully stocked library facility

Efforts to establish an electronic virtual library have recently been initiated and an international conference on the subject is being organized to share experiences on the latest developments in the field.

The Division has started functioning as a virtual information centre for corporate houses and other institutions. It is already an ENVIS (environmental information system) Centre on renewable energy and environment—one among 25 such centres sponsored by the MoEF. The Division, under this project, has set up the EMCBTAP (ENVIS–Environment Management Capacity Building Project) Node on Energy and Environment, developing and maintaining the nodal web site <http://sdnp.delhi.nic.in/node/teri/index.htm>. The library hosts a Mycorrhiza Network and also a Regulatory Information Centre under the South Asia Forum for Infrastructure Regulation initiative.

The Division organized two workshops on *Information resource management in an electronic environment* in 2002/03. The three-day workshops included discussions on theories, hands-on training sessions, and demonstrations of information products and services.

Building a mindset

Another significant area of activity of the Division is the communication of TERI's research findings and relevant information updates to a global audience using various media, thus engendering awareness of energy and environmental issues. Educating the young mind finds special attention in this exercise, so as to instil in them a sense of responsibility towards the environment. The Division has pioneered the GREEN Olympiad, India's first environmental examination for schoolchildren. GREEN Olympiad 2002 – the fourth edition since its inception in 1999 – was held in over 300 centres across the country with 40 000 students participating. As it went international the previous year, this year too it was held in the Middle East, Russia, and Nepal. The exercise does not end with the examination. The top 32 schools go on to a battle of wits in *TERRAQuiz*, a serialized quiz on Doordarshan—the national television network.

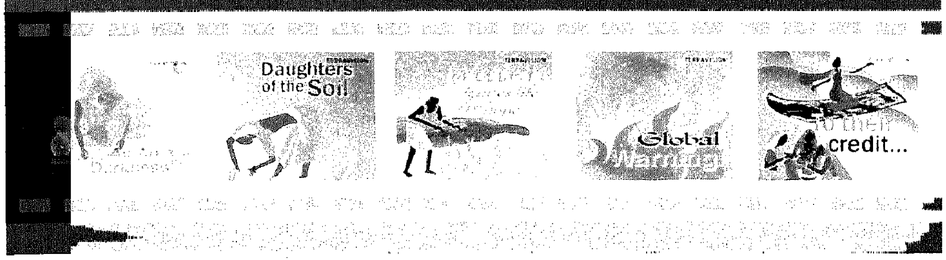
A series of environmental films was produced in 2002/03 under a project funded by the Swiss Agency for Development and Cooperation. Besides, supported by the United Nations Environment Programme and the MoEF, the division produced a film on climate change that looks

The third eye looking...



The Division made a series of short, well-researched films in 2002/03, supported by the Swiss Agency for Development and Cooperation. These films capture stark images of grim realities in India—realities of how alternative energy can light up rural India sunk in darkness; of how hardworking women farmers remain faceless; of how rural communities are rewriting their fate by harvesting water; of how climate change is ringing the warning bells; and, finally, of how rural women are empowering themselves with a simple and sustainable concept called micro-finance.

Each film highlights a pertinent issue, looming large in the time we live in; raises certain questions on the existing state of affairs; and explores ways that could lead to sustainability of life on earth. Titled suggestively to reflect what they talk about, the films are: *An Area of Darkness*, *Daughters of the Soil*, *Water Ignites Life and Hope*, *Global Warning!*, and *To their credit...*



at the universal aspect of the issue, highlighting the vulnerability of poor countries. Another film on pollution in the Yamuna river was also made for the Municipal Corporation of Delhi.

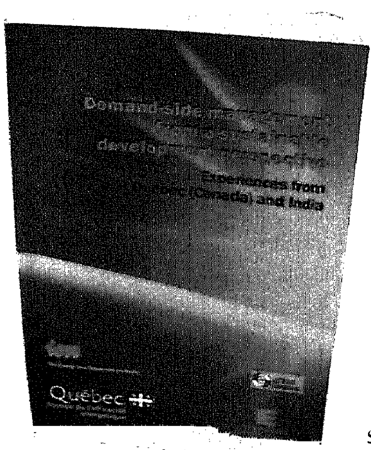
The Division also projects TERI's achievements through the mass media. It produces and distributes regular press releases, backgrounders, and information kits and frequently organizes press meets, conferences, and expert discussions to empower journalists with comprehensive and in-depth information on issues of sustainable development. It is thus helping forge a distinct position for environmental and related issues in mainstream media. One such effort was a media seminar on *Media and sustainable development: strategies for the future*. Attended by journalists from South Asia and the Pacific region and held in the backdrop of the Johannesburg Summit and CoP-8, the seminar apprised the media of fundamental issues related to the glaring North–South frictions. Following that, during TERI's Delhi Sustainable Development Summit 2003, a media dialogue on *Challenges post-Johannesburg: what the stakeholders have to say* was organized. Journalists and development practitioners from around the world brainstormed on the challenges and opportunities raised at Johannesburg.



Inking ideas

TERI's print products – created by a team of highly qualified and dedicated writers, editors, designers, graphic artists, and production supervisors – place great emphasis on quality, adhering to a stringent set of standards. Every year, the Division publishes about 150 items in print—books, data directories, proceedings of conferences, peer-reviewed primary journals, abstract journals, newsletters, monographs, brochures, posters, and so on. However, in 2002/03, the Division published nearly 180 items, catering to a diverse and ever-increasing audience. It is also developing research-supported books for common citizens, including schoolchildren, with the aim of popularizing the concepts of sustainability.

The subscriber base of the Division's fortnightly 'green' e-zine, *TerraGreen*, accessible at <www.teriin.org/terragreen>, was enhanced significantly in 2002/03. Harnessing the vibrancy of the Internet, *TerraGreen* reaches out to concerned citizens in about 125 countries, with lucidly written stories, factfiles, newsbreaks, and features on a host of issues on the sustainable development agenda.



A significant product that the Division brought out is a manual of the house style—a ready reference for the specialized field of scientific and technical publishing worldwide. Another notable product is *Demand-side management from a sustainable development*

perspective: experiences from Quebec (Canada) and India—a book that explains the concepts and promotes the practice of demand-side management at the micro level so as to come to terms with the ever-increasing demand for energy.

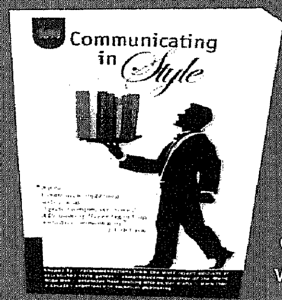
Caring to share

The ITS Division promotes TERI's research outcomes and information products – books, journals, newsletters, electronic services, and so on – to a global audience through various distribution channels such as online catalogues, ordering and registration facilities, e-mailers, direct mailers, and distributors/bookstores. The Division also participates in national and international trade shows, conferences, workshops, and exhibitions.

The Division manages a contact database – with more than 7000 entries spread over 79 countries – that includes industries and corporates, educational institutions, consultancies, government bodies, NGOs, and individuals. The database is regularly updated. Dissemination efforts made in 2002/03 resulted in partnerships with many international organizations to help them establish their networks of contacts for spreading their specialized information.

Introduced in 2002/03, the membership-based, customized information packages – TIS (TERI Information Service) and EEN (Energy and Environment News) – proved extremely useful for corporates, libraries, and individuals in gaining access to valuable and relevant information in specialized fields of learning.

Communicate in style



Anyone who has a message to communicate wants it to have a well-groomed look, which numerous style manuals help impart. But, for the likes of researchers and academics – ones who are long on technical expertise but short on time – style manuals are certainly daunting and tedious. Alternatively, they choose to have their writing copy-edited by professionals.

At TERI, researchers have an edge over many others as the Publications Unit, with its professional copy-editors and writers, scans each document before it is delivered to its specific target audience. *Communicating in Style* – published by TERI in 2003 – is a compilation of what these editors have learnt over the years from editing project reports, research papers, newsletters, presentations, manuals, posters, and web pages—a variety of formats matched only by the variety of contents, ranging from air pollution in rural kitchens to global climate change, from bacterial consortia to forests, from policy-making to practical instruction in propagating plants.

Communicating in Style steps in after you have the text of your communication in draft form. The book tells you how to polish that draft; add finishing touches to make your message sparkle; and design it to create a favourable – and lasting – impression, all by yourself.

Regional Centres

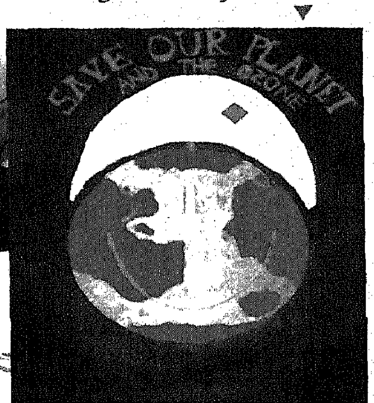
Southern Regional Centre, Bangalore

Since its inception in 1990, TERI's Southern Regional Centre has been promoting energy efficiency improvement concepts and practices in industry. With its finger on the pulse of the industry, the Centre's mandate ranges from consultancy, training, research, and information dissemination to energy audits and other environmental initiatives.



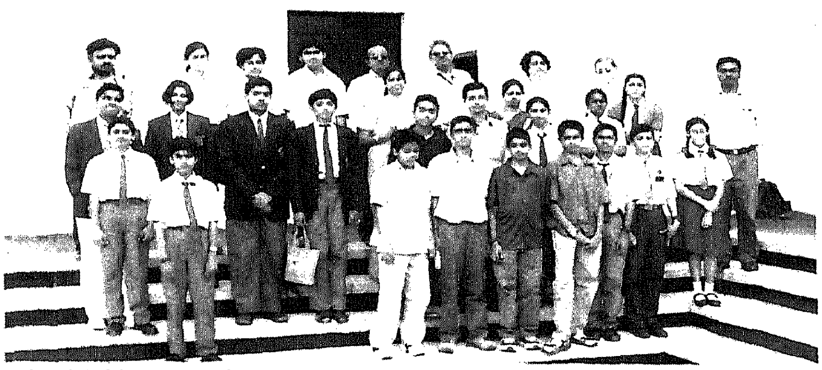
Planting of saplings by children of the staff on the eve of Independence Day

Prize-winning poster during Ozone Day celebrations





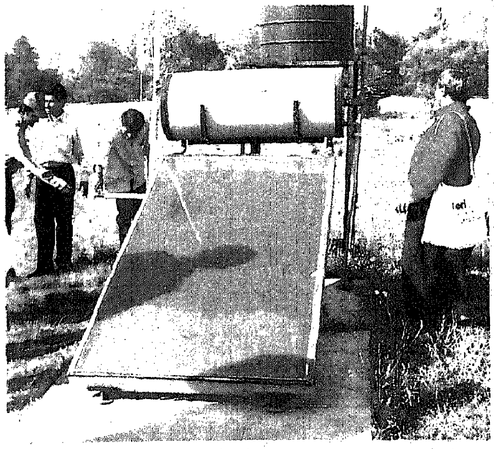
Independence Day celebrations (first year) at TERI-SRC premises



Schoolchildren with the TERI team during Ozone Day celebrations

The Centre participated in the Ozone Day celebrations on 16 September 2002, organized by the Ministry of Environment and Forests, Government of India; the Government of Karnataka; and the Karnataka State Pollution Control Board. The Centre took it as an opportunity to spread awareness on the need to protect the ozone layer. The focus was mainly on schoolchildren. A poster competition and a debate on the pros and cons of 'local actions' versus 'global initiatives' to protect the ozone layer were organized. An on-the-spot quiz competition and several multimedia as well as regional language presentations were held. School and college teachers also participated enthusiastically. Prizes were distributed by Mr T R Baalu, Hon'ble Minister for Environment and Forests.

The Centre is a partner in the Rural Energy Entrepreneurship and Institutional Development



Field visit to a solar water heater by participants of the Entrepreneurship Development Programme

Participants of the Entrepreneurship Development Programme getting familiarized with the working of a biogas plant





An interactive session at the Entrepreneurship Awareness Camp

scheme run by the Ministry of Non-conventional Energy Sources. The scheme promotes entrepreneurial capacity building to provide quality installation and after-sales servicing for energy systems and devices. The Centre conducted four day-long EACs (entrepreneurship awareness camps) and one month-long EDP (entrepreneurship development programme) as part of this scheme.

The four EACs were held in Kolar, Dharwad, and Bangalore in Karnataka and in Ambur in Tamil Nadu. The objectives of these camps were to enhance awareness among rural and semi-urban youth of renewable energy applications and their potential, and to encourage the youth to become entrepreneurs. These camps also helped in identifying those that were keenly interested in doing so and could be given comprehensive training (through the EDP) in establishing and running a business.

The programme attracted 20 participants and was held in Bangalore between 27 February and 27 March 2003 in three modules, namely technology, finance, and personality development. The participants included turnkey workers, unemployed youth, and businessmen wanting to diversify their sphere of activities.

The Centre has established its reputation as an insightful and reliable energy adviser. Among the energy audits conducted during 2002/03 was that of the auxiliary system of Tanir Bhavi Power Plant, Mangalore, which is one of the largest barge-mounted stations worldwide, and the first in India with a combined cycle of 230 MW (megawatt). The findings of the audit were well-received by the plant management. One of the major findings was that the generating capacity can be increased by 3 MW without any increase in the auxiliary power consumption, which was demonstrated as part of the fieldwork.

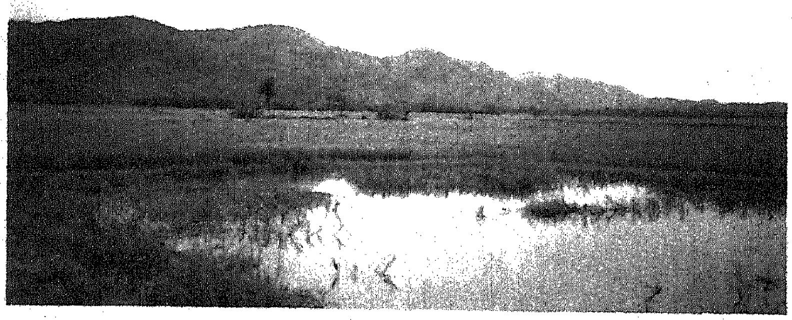


Dr Wakako Hironaka, Member, House of Councillors, Japan, and Member, TERI's Governing Council, planting a sapling

North-Eastern Regional Centre, Guwahati

TERI's North-Eastern Regional Centre in Guwahati, in keeping with its mission, consolidated its role as a resource agency by extending its professional services to state governments, private sector, and NGOs to promote sustainable development in the north-east region of India.

In continuation of its activity related to biomass resource assessment at the block level for gasifier-based power generation, the Centre conducted two such exercises during the year, in Patharkandi and Balijana blocks of Assam for the state nodal agency, leveraging the Centre's technical expertise in having completed more than 20 rural energy planning studies. Besides, an evaluation of tree plantation and afforestation activities was also executed for West Siang District, Arunachal Pradesh, carried out annually under the 16 to 20 Point Programme of the National Afforestation and Eco-Development Board, Ministry of Environment and Forests, Government of India.


Watershed conservation and development in the Kalang watershed, Assam

In an endeavour to develop economically and environmentally viable alternatives and innovations for resource conservation, the Centre has undertaken a pioneer project on watershed conservation and development in the Kalang watershed, Kamrup district, Assam, covering an area of 2500 hectares. The ongoing initiative promotes sustainable economic development for 1050 households in a peri-urban environment, where 60% of the communities are directly dependent on agriculture for their daily livelihood. The project proposes to increase the income and access to food, based on interventions relating to farm intensification and diversification, income generating programmes, increased availability for rural credit, and so on.

Communities practising *jhum* (slash-and-burn farming) have been rendered poorer day by day. A model rehabilitation package conducive for a subtropical agro-climate has been designed covering agriculture, horticulture, forestry, and medicinal plant components of economic significance.

The satellite centre set up to popularize micropropagation technology, with support from the Department of Biotechnology, Government of India, continues to forge ahead with the production and hardening of plants propagated by tissue culture. Several economically important species of the region – banana: *malbhog, jahaji*; citrus: Assam lemon, round lemon, and *khasi* mandarin; orchids: red *vanda*, blue *vanda*, *vanda parishii*;

forestry species: paulownia, bamboo; and spices: vanilla, turmeric – are being multiplied at the satellite facilities. Currently, large-scale hardening of tissue-cultured vanilla plants is in progress for dispatch under the present planting season. In addition, tissue-cultured banana of the *Sabri* variety of Tripura and turmeric of the *Lakadong* variety of Meghalaya are under hardening phase for field trials in the respective native environments and at the regional hardening unit at Byrnihat. Till June 2002, over 25 000 tissue-cultured plants of forest species and horticulture species had been dispatched from the Centre to the Barak River Valley Development Authority, Manipur; Floritech India, Nagaland; and individual growers in Meghalaya.

Simultaneously, field trials are under way for citrus at Khetri under Dimoria Block, and patchouli and vanilla at TERI's Byrnihat field station. Also, the Centre organized a training programme on propagation and management of bamboo for entrepreneurs of the region and a week-long training on plant tissue culture for government officials of ministries of agriculture, horticulture, and forests.


Low-cost hardening unit at Byrnihat field station

Over the last two decades, SoE (state of the environment) reporting in India has ranged from grass-roots initiatives to citizens' reports along with media and academic documents of mixed quality. The Government of India – through a scheme to streamline and systematize SoE reporting in the Tenth Five-year Plan – has enlisted four national host institutions for rendering assistance in setting up SoE reporting systems. The basic objective has been to design and operationalize a participatory and scientific SoE reporting system in India that enables informed policy/ strategy formulations, decision-making, and follow-up action. The Centre is undertaking the SoE reporting exercise in three states of the north-eastern zone, namely Arunachal Pradesh, Nagaland, and Tripura.

The North-Eastern Centre and TERI's BETA (Biomass Energy Technology Applications) group have designed a project—'Potential assessment of biomass gasifiers for various applications in north-eastern states'—that aims at potential market assessment of biomass gasifier systems for a variety of thermal as well as electrical power applications to improve the overall thermal efficiency and power availability in remote rural areas.

The Centre has undertaken another project on 'Feasibility of developing processing technique to convert *phumdis* waste of the Lokatak Lake into wealth', again in association with the BETA group. The major objective of the proposed study is to assess the feasibility of developing *phumdis* processing technique to convert it into fuel briquettes, as well as to assess the possibility of value addition through products such as animal fodder or organic manure.



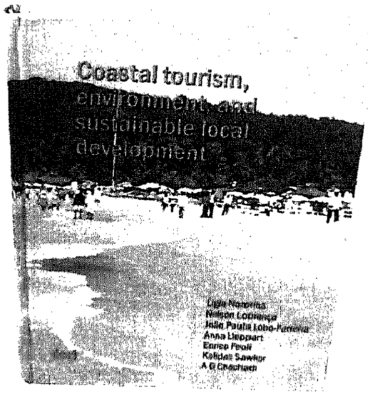
Workshop on technology applications for Assam, held at Guwahati

To bridge the information gap in the fields of biotechnology, energy, and environment, the Centre has been demystifying technologies and building awareness amongst professionals from NGOs, government departments, and private organizations through various training programmes. The Centre, in association with the various divisions of TERI, has organized a series of specific training modules in the area of solid waste management, energy-efficient buildings, plant tissue culture, and environment-related health hazards for government officers from the north-eastern region.

Western Regional Centre, Goa

TERI's Western Regional Centre continues to be an important voice and research base on issues within the development–environment interface, pursuing cross-disciplinary work and experimenting with multi-stakeholder approaches. The Centre has a number of collaborations with international research organizations in Europe, Asia, and Latin America, and is engaged in a number of research networks.

The project 'Measuring, monitoring, and managing sustainability: the coastal dimension' (funded by the EU-INCO-DC [European Commission's Programme for International Cooperation with Developing Countries]), which the Centre coordinated with four international and three Indian partner institutions, came to an end this year. The project was concerned with understanding how development drivers such as tourism, aquaculture, and industry, when located in coastal areas, affect ecosystems and how these impacts can be measured, monitored, and managed in order to achieve sustainable development. To enable a comparison of development drivers and location, indicators that reflect the societal drivers and health of the ecosystems in typical situations of tourism, aquaculture, and industry were developed. Some important outputs of the project are as follows.



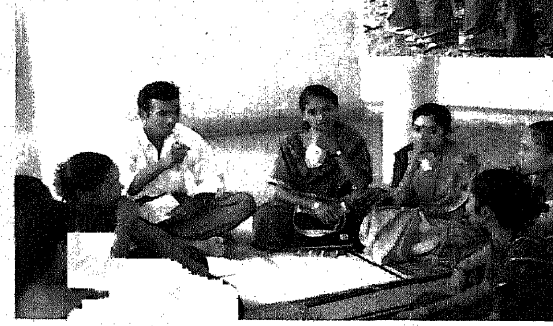
- A framework of indicators of coastal vulnerability to threats from development
- A framework for an integrated analysis of the social and ecological dimensions of coastal development
- Decision-making tools to study impacts of choices in selected locations

- Indicators of drivers, pressures, and ecosystem health
- A method for stakeholders to obtain a quick and composite picture of pollution levels in various marine bodies
- An approach to developing scenarios using multi-stakeholder concerns
- A management policy for groundwater using optimization techniques and protection zoning
- A commentary on Indian and European Union policies.

Extensive dissemination of the outcome is under way through meetings, journal articles, a multi-authored volume on the work on tourism, and discussions with state and local governments to encourage research uptake and application. The project web site reflects its rich outputs.

Members of TERI / DEMPO team being trained in monitoring activities as part of rehabilitation trials at the DEMPO mine site



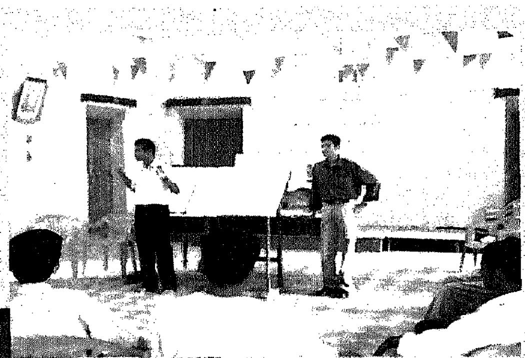


Women participants in a discussion on self-help/ micro-credit group formation, as part of the project dealing with regenerating mining areas using tri-sector partnership,

The Centre has taken up another EU–INCO–DC-supported project titled 'Interest' (Interactions between the Environment, Society and Technology). The project assesses ecosystem changes by understanding and analysing community ecosystem practices, and strengthens the environmental and social knowledge base. This involves (1) understanding local farmer-/ fisher-/forester- and community-driven knowledge; (2) linking traditional and scientific knowledge to describe pressures, challenges, and innovation; and (3) using dissemination tools to deliver this new, improved knowledge to different levels of society. TERI is specifically working on small-scale farming systems in rural and peri-urban areas in Karnataka, and traditional aquaculture systems in Goa.

Another project that the Centre is involved in is 'Planning of sustainable regeneration in mining areas using tri-sector partnerships', a project supported by the Department for International Development, UK. This project has two components: technical and social. The social objectives are to help local communities in two watershed programmes and develop a plan for alternative employment opportunities in the mining region. The technical objective of this research is to assess the alternative uses of abandoned mine pits as water storages or refilling them and converting them into usable land. This will contribute significantly to the village economy, ecosystem improvement, and social equity. Participation of the local population in the development of the plans will empower them to implement them for overall improvement of ecological and environmental quality of the village. Hence, all objectives are proposed to be addressed through partnerships with local community,

mining companies, and the government. This project is a logical extension of the research being pursued by TERI in promoting sustainable development in the minerals industry internationally. The involvement of the Department of Mining, the Minerals Foundation, Goa Mineral Owners Exporters' Association, local villagers, local Panchayats, and a local NGO is being sought to realize the target.



Training-cum-discussion with communities by resource persons and the watershed development team for the implementation activities through a participatory approach



Folk dance by members of self-help groups on the eve of a watershed festival

The 'Dicholi watershed development project' – under the National Watershed Programme for the Development of Rainfed Areas – has just commenced to help develop a watershed in the Dicholi area. The project is being executed through a memorandum of understanding with the Department of Agriculture, Government of Goa. The objective of this project is to assist local communities in their efforts to conserve, improve, and protect their natural resources through comprehensive watershed management.

The Centre has also been engaged in a national project on developing state gender budgets. The National Institute of Public Cooperation and Child Development carries out the gender budget analysis, on the lines of the Union gender budget undertaken by the National Institute of Public Finance and Policy. The state gender budget analysis covers 25 states and has involved a number of research organizations across the country. The Centre carried out this study for the state of Goa for 2000/01.

The Centre also organized, jointly with Goa University, an international seminar on environmental governance and security in December 2002, supported by the Konrad Adenauer Foundation. A workshop on theme 'WTO: tourism and environment' was held in February 2003 in collaboration with the Goa University, the International Centre (Goa), and the Strategic Management Forum.

In a spirit of collaboration, and with the strong belief that joint research is the way forward, the Centre has developed research links with the following organizations.

- National Institute of Oceanography, India
- Goa University, India
- Corporate Citizen Unit, University of Warwick, UK
- Institute of Arable Crops Research, Rothamstead, UK
- University of Antioquia, Colombia
- Universidade Nova de Lisboa, Portugal
- Laboratorio Nacional de Engenharia Civil, Portugal

- Instituto Cartografic de Catalunya, Spain
- Universita Degli Studi di Trieste, Italy
- Wageningen University, The Netherlands
- Rubber Research Institute, Sri Lanka .
- Environment and Public Health Organization, Nepal.

Eastern Regional Centre, Kolkata

In order to broaden the reach of TERI's grass-roots activities across the nation, a new office was set up in Kolkata, West Bengal, in October 2002. To begin with, the Centre will work primarily on a project financed by the Asian Development Bank – the Kolkata Environment Improvement Project – dealing with water and sanitation facilities in the city of Kolkata.

More specifically, the project focuses on improving the living condition in the KMC (Kolkata Municipal Corporation) area, through the provision of essential urban infrastructure and municipal services to meet basic human needs and sustainable development of the region. The objectives of the project are to

- assist in the development of KMC as a proficient and autonomous municipality;
- improve the environmental conditions in the KMC area;
- reduce poverty in the low-income areas by providing affordable access to basic urban services;
- facilitate community empowerment through participatory processes; and
- protect the environment from adverse developmental impacts.

Within the project, TERI's work primarily involves the creation of channels of communication between the project management unit and the stakeholders; extensive awareness generation exercises with regard to matters of health and hygiene, rights and responsibilities of the citizens, and project activities and aims; community mobilization in order to develop a sense of ownership of the basic amenities being offered; and an assessment of willingness to pay for the same.

The project has enabled TERI to consolidate its presence in the region. TERI plans to expand its area of operation beyond the present project activities in due course of time.

TERI's Research Initiative at Supi for Himalayan Advancement, Uttaranchal

TERI has set up a development resource centre at Supi, near Mukteshwar in Uttaranchal. The initiative was inaugurated by the Hon'ble Chief Minister of Uttaranchal, Mr N D Tiwari, in October 2002. The regional centre – TRISHA (TERI's Research Initiative at Supi for Himalayan Advancement) – aims to train farmers and villagers in the

latest agricultural techniques and practices. To this effect, the Uttaranchal government has allotted 7.5 hectares of land – originally a potato seed farm – at a mean alleviation of 7100 feet above sea level.

With the local economy depending largely on agriculture, the project targets to reduce the drudgery of the farmers while improving the quality of the agricultural produce. Yields of traditionally grown plants developed by TERI as well as other organizations will be demonstrated at the Supi farm, which will encourage entrepreneurship among the local farmers, leading to the opening of a business—the developing and marketing of improved seeds.

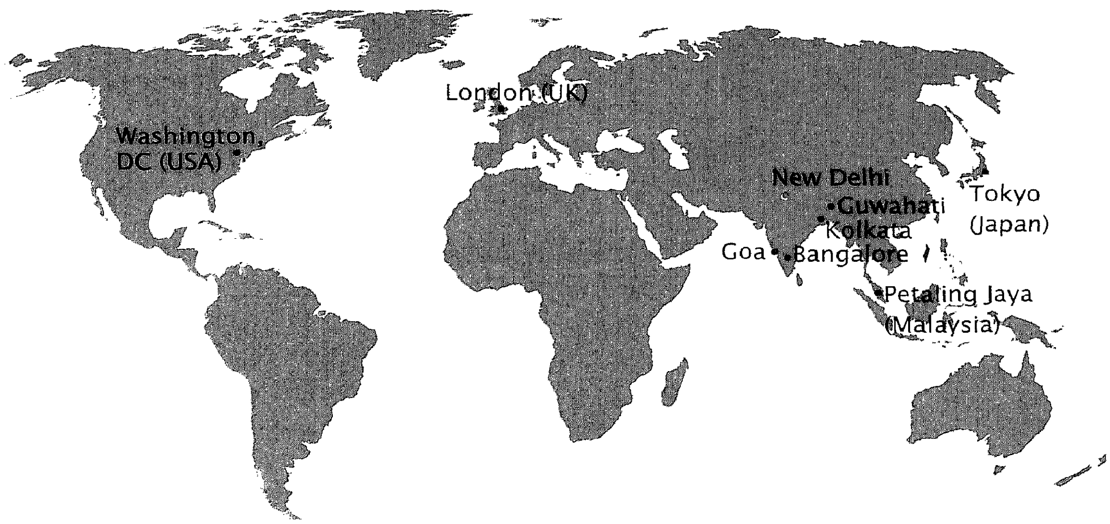
Since Uttaranchal is blessed with unique agro-climatic conditions, TRISHA is now evaluating various new and improved varieties of traditional and non-traditional crops – both fruit and vegetables – that can be introduced in the Supi region. The required technology will also be made available to local farmers. This activity will be further intensified in the imminent growing season. Besides, the Centre is planning to promote the use of biofertilizers and integrated pest management in the region. Plans for the future also include the formation of village cooperatives through which the produce can be smoothly marketed.

Field trials of tissue-cultured plants of *Swertia chirata* at three locations – Supi, Mandal, and Pothibasa – are in progress. Results obtained so far are encouraging and, therefore, TRISHA has decided to undertake the distribution of tissue-cultured plants of *S. chirata* in the state on a large scale. The Centre is also collaborating with the Herbal Research and Development Institute at Gopeshwar in this context. Besides, the importance of improved agro-techniques in cultivation of medicinal plants will be demonstrated to the local growers.

To cater to the local need, a mobile soil-testing laboratory has been proposed. Since soil in this region suffers from micronutrient deficiency, such analysis will enormously help improve the productivity. Financial support for this venture is likely to be provided by the Technology Information, Forecasting, and Assessment Council. More research projects that could contribute to the sustainable development of Uttaranchal are under way.

TERI Worldwide

TERI strives to sustain a global vision to encompass the universal nature of problems that human society faces today and may face in the future. Its activities move from formulating local- and national-level strategies to suggesting global solutions. Over the years, TERI's global affiliates and centres have developed strong collaborations with like-minded institutions and important organizations to further the cause of sustainable development.



TERI, North America

Global Forum for Collaborative Research: Strengthening Implementation of the Johannesburg Commitment for Sustainable Development

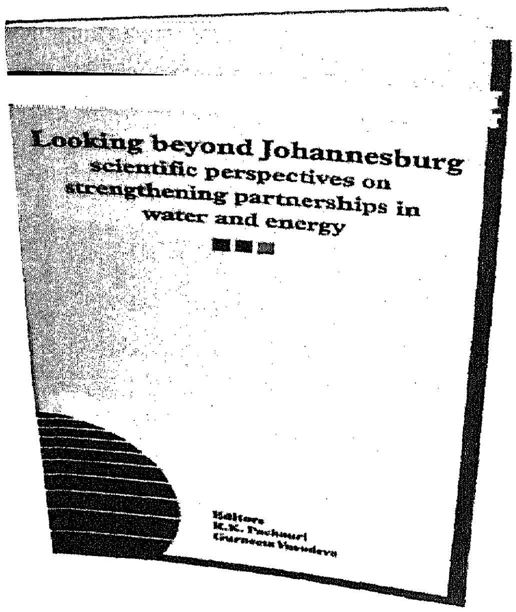
The Forum aims to bring together research institutions from the developed and developing countries to undertake collaborative applied research and policy analysis to strengthen the commitments undertaken by the international community at the World Summit on Sustainable Development. Specifically, the Forum focuses on developing research projects that complement the Type 2 partnerships in the water, energy, and health sectors and addresses questions with respect to the integration of scientific and technological knowledge in the policy-making

process, strengthening of institutional and governance mechanisms, and the role of business in bringing new technologies to developing-country markets.

The Forum was launched with the support of the Heinrich Böll Foundation at a meeting organized in collaboration with the Global Governance Project on 9 April 2003 in Berlin, Germany.

Global Partnerships for Sustainable Development: Harnessing Action for the 21st Century

Colloquium III – Looking beyond Johannesburg: scientific perspectives in strengthening partnerships in water and energy



This colloquium was organized on 2 December 2002 in collaboration with the National Academies and was sponsored by the United Nations Development Programme, BP, and Johnson and Johnson. The colloquium was designed to achieve the following objectives.

- Review key partnerships in the areas of water and energy at the regional and global levels and the specific tasks and timetables for implementing action plans.
- Understand the role of governments, corporations, and NGOs involved in these partnerships and specific challenges pertaining to accountability, transparency, compliance, monitoring, etc., that need to be addressed in this regard.
- Review governance structures and financing mechanisms for the partnership programmes, including the principle of 'common but differentiated responsibility' and local ownership of the process.
- Evaluate criteria for entering into partnerships thereby addressing issues of resource complementarity, common political approach, etc.
- Identify new stakeholder groups and specific entities for involvement in existing and prospective partnership programmes.
- Discuss the deliverables from the partnership programmes in the context of credible, measurable objectives and milestones, assessment criteria and indicators, reporting, monitoring, and verification mechanisms at the UN level involving both governments and major groups, financing mechanisms, and gender-specific tools and data.

Environmental Security

Simulation of an oil spill in the Strait of Malacca

In collaboration with Booz Allen and Hamilton, USA, and with TERI-New Delhi, TERI-NA carried out a study to explore the regional implications of a maritime environmental disaster – an oil spill in Strait of Malacca – in the South Asian region.

'ERI, Europe

In 2002/03, TERI-Europe continued its work on programmes relating to the Kyoto Protocol and renewable energy, sustainable building design, sustainable trade in the textiles and garments sector, and corporate responsibility in selected South Asian countries.

Developing CDM projects for renewable energy technologies

Sponsored by the FCO (Foreign and Commonwealth Office) of the UK, TERI-Europe has completed a study seeking to commercially cast viable renewable energy projects as potential CDM (clean development mechanism) projects. TERI-Europe worked with five proponents of different types of renewable energy technologies to assist in the calculation of baselines and transaction costs. As part of this activity, a set of guidelines for developing CDM projects in the renewable energy sector has been elaborated. Additional information on potential partners in India and the UK, interested in developing CDM projects in India, has also been provided.

TERI-Europe is also a partner in an important Type 2 partnership launched at the World Summit on Sustainable Development. This *Renewable Energy and Energy Efficiency Partnership* is sponsored by the FCO.

Facilitating sustainable trade in the textile and clothing sector

The past year saw the completion of a review of environmental and social requirements faced by developing-country textile and clothing exporters to the EU (European Union). The comprehensive database on environmental and social requirements for the textile and clothing sector, which the review yielded, has been compiled on a CD-ROM. It provides a ready tool to access information on technologies, retail sources, and trade links.

Sustainable building design: strengthening capacities for planning and implementation

As part of the EU (European Union)-funded Asia Urbs Programme, TERI-Europe is engaged in a project, aimed at improving urban environment through the introduction of sustainability measures in building design. The project is being jointly implemented with RENUE in the UK; the ICAEN (Institut Catalana d' Energia) in Barcelona, Spain; TERI in Delhi, India; and the Haryana Energy Development Agency in Gurgaon, India. The project aims to exchange advice and good practice between the EU and India. The specific objective of the project is to provide guidance and advice on best practices to the local government in the Gurgaon district to

- develop sustainable building design plans based on the concepts of energy conservation, energy efficiency, and RETs (renewable energy technologies), through consultation and engagement with key stakeholders in the planning area;
- strengthen the capacity of building practitioners (builders, plumbers, engineers, architects, etc.) to implement sustainability measures in new and existing buildings;
- develop a communication strategy for local authorities on how they may engage with the private sector and the local community in implementing sustainable energy options in habitats/buildings, and in fostering links between partners and the local communities; and
- enhance economic regeneration and community development through the promotion of RETs in buildings.

These objectives will be achieved through workshops, seminars, and training programmes. A comprehensive manual targeted at various stakeholders (planners, architects, developers, technicians, etc.) will be produced, emphasizing the importance of an integrated approach to introducing sustainability in building design. Other outputs of the project will include CDs, policy seminars, learning modules, and marketing materials for dissemination through a dedicated web site.

A series of three seminars and workshops will be held in each of the participating countries over the next one year to exchange views, ideas, and methods. The project will result in the preparation of written guidance and advice on sustainable buildings and training advice for the building industry. The project will develop a better understanding of good practice in Europe and India, and enable an exchange of views between India and Europe on sustainable building guidance.

Under the same programme, sponsored jointly by the EU and the CSC (Commonwealth Science Council), pilot demonstrations on management of supply chains and adherence to environmental, social, and trade regulations were conducted in two factories each in Bangladesh, India, and Sri Lanka. The following aspects were carefully considered.

- A suitable methodology for conducting the demonstrations, combining the environmental, social, and economic aspects of supply chain management, was identified. It was derived from the work done by the Eco-tex Institute for Ecology in Cologne, Germany.
- Two factories each in Bangladesh, India, and Sri Lanka were selected for assessing and piloting of the methodology. The factories were familiarized with the methodology and had to provide detailed company profiles as prerequisites for the assessment.

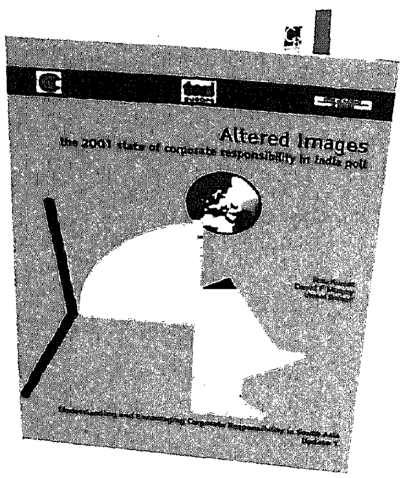
On the basis of the results of these activities, a strategy for sustainable trade in the sector was elaborated.

Promoting corporate responsibility in South Asia

TERI-Europe has completed a major exercise – sponsored by the DFID (Department for International Development), UK – to document corporate responsibility practices in Bangladesh, India, and Sri Lanka to help develop training modules for companies and academic institutes on environmentally and socially responsible business practices.

A poll carried out by TERI-Europe has revealed a compelling agenda for corporations in India to demonstrate their social responsibilities. The poll of over 1200 individuals in Chennai, Kolkata, Mumbai, New Delhi, and Tiruppur surveyed the perceptions and expectations of workers, company executives, and the general public towards businesses in India. The poll was the first of its kind to include workers in a survey of corporate responsibility, thereby giving a unique balance to the results. Five major findings emerged.

1 The IT (information technology) sector is regarded as the most responsible while the alcohol and the tobacco industries as the least.



2 Public expectations of corporations in social and environmental matters are high and rising.
3 More trust is placed in the media and NGOs than in business or trade unions; global companies operating in India are rated low in terms of trustworthiness.
4 Gender discrimination is a real issue in the workplace.
5 Workers and management have sharply diverging perceptions of labour conditions.

The poll results were presented as a report titled *Altered Images: understanding and encouraging corporate responsibility in India.*

The initiative brings together a range of partner organizations including TERI-Europe, the New Academy of

Business (UK), TERI (India), the Centre for Policy Dialogue (Bangladesh), and the LGA Consultants (Sri Lanka). The project is funded by DFID's Asia Division. Additional support has also been obtained from the CSC, UK.

The partners' vision is to contribute towards a positive change in business practices and attitudes that support sustainable development and poverty eradication in the region. The initiative focuses on the expansion of the knowledge base of corporate practices in South Asia relating to working conditions in factories, living conditions in surrounding communities, environmental protection, and corporate accountability and transparency. In this way, the initiative aims to provide useful information and tools (such as training materials) for South Asian companies and civil society groups, especially the more vulnerable income groups, in the three countries. This, it is hoped, will eventually assist in elaborating a home-grown agenda of corporate responsibility that is sensitive to the social, cultural, and economic situation in Bangladesh, India, and Sri Lanka.

TERI, Japan

The representative office of TERI in Japan continues to build upon the momentum provided by the inaugural symposium, that was organized in October 2001, and promotes contacts and relationships with counterpart research institutions, universities, relevant government departments, and the corporate sector in Japan. Such contacts are further strengthened by the visits to Japan by the Director-General of TERI, to make presentations and participate in various conferences other than meetings of the Board of IGES (Institute of Global Environmental Strategies).

TERI-Japan continues to benefit from its close relationship with IGES, where its office is located, and the researchers from the two institutions have numerous opportunities to interact with each other through joint activities or attendance at conferences. Efforts are also under way to seek collaboration with Japanese NGOs in the area of sustainable development.

During 2002/03, when India and Japan celebrated the 50th anniversary of the establishment of diplomatic relations between the two countries, TERI's presence in Japan was highlighted by the participation of the coordinator of TERI-Japan in some important conferences and events.

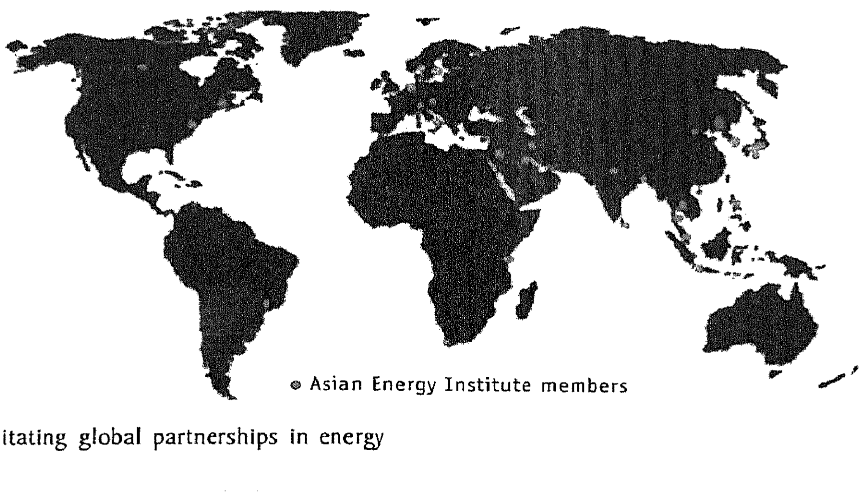
TERI-Japan: projects

The year 2002/03 saw TERI-Japan consolidate its research network and take on a number of interesting activities in collaboration with Japanese institutions. Its activities included four projects for the Institute for Global Environmental Strategies, dealing with (1) environmental industry development in developing Asian countries, (2) innovative financing for renewable energy development, (3) strategic policy options for promotion of biomass, and (4) improvement of environmental performance of small- and medium-sized enterprises. For the New Energy and Industrial Technology Development Organization, TERI-Japan undertook (1) a survey of the energy and environmental situation in India and (2) a baseline study of small-scale industrial clusters for clean development mechanism projects. Ideas for projects in the pipeline include an integrated approach to natural resource development and poverty reduction in Haryana, India, to be sponsored by the Japan Bank for International Cooperation.

While convening the Asian Relations Conference in 1947, Mahatma Gandhi appealed to Asians to seek an identity in the post-colonial age unique to the region. Four decades later, the Asian Relations Commemorative Conference, held in New Delhi, India, in 1987, emphasized the need for establishing an Asian collaborative research entity on energy. As if on cue, TERI, supported by the Government of India, responded by taking the initiative to launch the AEI (Asian Energy Institute) in New Delhi in August 1989. A network of 15 energy institutes from Asia at its inception, the AEI has since grown to include representatives from Bangladesh, China, India, Indonesia, Iran, Japan, Jordan, Korea, Kuwait, Malaysia, The Philippines, Sri Lanka, and Thailand. Not limiting its reach within the boundaries of Asia, the Institute has expanded to include associate members from Austria, Brazil, Canada, Italy, Japan, The Netherlands, Norway, South Africa, Sweden, Tanzania, Thailand, and the US. At the Institute's launch, TERI was chosen to host its Secretariat, a position it continues to hold. TERI also hosts the web site of the AEI <www.teriin.org/aei/>.

The AEI aims to draw upon the expertise in the region to

- promote greater information exchange;
- facilitate the sharing and dissemination of knowledge;
- undertake research and training activities of common interest to its members; and
- analyse global energy developments and their implications.



Facilitating global partnerships in energy

The focus of the Institute's initial collaborative efforts was on climate change and global warming. Between 1989 and 1993, the AEI undertook a collaborative study on Asia's and Brazil's contributions to greenhouse gas emissions and policy responses for their minimization, the results of which were published in (1) *Global Warming: mitigation strategies and perspectives from Asia and Brazil* and (2) *Global Warming: collaborative study on strategies to limit CO_2 emissions in Asia and Brazil*. The third AEI publication, *Climate Change in Asia and Brazil: the role of technology transfer*, was the result of a collaborative study on the transfer of energy-efficient technologies – specifically cogeneration and efficient lighting – in the context of climate change. The members also undertook a study on 'National energy policies: implications of and opportunities from the Climate Change Convention'. Recently, AEI members from Bangladesh, China, India, and Indonesia have collaborated on a project to identify the potential for clean development mechanism projects in their respective countries, and developed project briefs for a few candidate projects. Some other studies undertaken are as follows.

1 Deployment of sustainable energy systems: an agenda for cooperation
2 Energy security issues in Asia
3 Sustainable energy: perspective for Asia

This year, the AEI completed a study on the 'Review of natural gas markets in Asia', for the Japan Gas Association. The key issues addressed were the current situation of natural gas industry, current obstacles to free natural gas trade in Asia, and the main driving forces that will affect the future role of natural gas in Asia.

AEI members have also undertaken research on different aspects of energy policy, including

- energy security,
- wider deployment of sustainable energy systems with a special focus on the urban transport sector and the scope for renewables, and
- sustainable energy perspectives for Asia, based on an evaluation by experts of priorities for development in the energy sector in Asian countries, in the context of impetus provided by the Rio Summit in 1992.

The AEI will aim to address the following issues in the near future.

- *Technology and its role in poverty alleviation* To bring improved technologies into the lives of the poor, especially those living in rural areas, a complex of information technology, agricultural technologies, biotechnology for agriculture, and renewable energy technologies needs to be instituted. This requires action research at the grass-roots level, which could be undertaken by the AEI if member institutions adopted villages for implementation of projects. This would be developed as a long-term programme, which will integrate policy analysis, research, and implementation.

- *Contribution to the climate change negotiations* At CoP-8 (the eighth session of the Conference of the Parties to the Framework Convention on Climate Change), a new formal constituency was launched, namely the 'Research and Independent NGOs', aiming to provide independent research and analysis to address both the causes and consequences of climate change. In this context, the AEI members can launch an Asia chapter to provide relevant analyses for long-term issues related to climate change, including the debate on commitments beyond the first commitment period of the Kyoto Protocol.

The members and associate members of the AEI bring together, under the aegis of the network, their wide-ranging experience and expertise to tackle common concerns and issues of regional and global interest.

Associate members of the AEI network

- International Institute for Applied Systems Analysis, Austria
- Biomass Users Network, Brazil
- International Institute for Sustainable Development, Canada
- Fondazione Eni Enrico Mattei, Italy
- Asia Pacific Energy Research Centre, The Institute of Energy Economics, Japan
- Netherlands Energy Research Foundation, The Netherlands
- Centre for International Climate and Environmental Research-Oslo, Norway
- Energy Development and Research Centre, University of Cape Town, South Africa
- Stockholm Environment Institute, Sweden
- Centre for Energy, Environment, Science and Technology, Tanzania
- Thailand Environment Institute, Thailand
- Center for Environmental Initiatives, Massachusetts Institute of Technology, USA
- World Resources Institute, USA

Members of the AEI network

- Petroleum and Mineral Resources Engineering Department, Bangladesh University of Engineering and Technology, Bangladesh
- Global Climate Change Institute, Tsinghua University, People's Republic of China
- The Energy and Resources Institute, India
- Centre for Research on Energy and Material, Institut Teknologi Bandung, Indonesia
- The Institute for Political and International Studies, Iran
- Global Industrial and Social Progress Research Institute, Japan
- The Institute of Energy Economics, Japan
- Royal Scientific Society, Jordan
- Council on Energy and Environment, Korea
- Korea Energy Economics Institute, Korea
- Kuwait Institute for Scientific Research, Kuwait
- Pusat Tenaga Malaysia (Malaysia Energy Centre), Malaysia
- Energy Development and Utilization Foundation Inc., The Philippines
- Institute of Fundamental Studies, Sri Lanka
- Energy Research Institute, Chulalongkorn University, Thailand

TERI School of Advanced Studies

An Institution for Constructive Inquiry

The TERI School of Advanced Studies has evolved as a research university and attracts some of the finest minds from across the globe. The genesis of the TERI School is rooted in TERI's comprehensive research, consultancy, and outreach programmes in the fields of energy, environment, and sustainable development. India's University Grants Commission granted the 'Deemed University' status to the TERI School in October 1999.

The TERI School's relationship with TERI has propelled the evolution of its academic units. This relationship is enshrined in an MoU (memorandum of understanding) encompassing collaborative research and programmes, joint studies, and mutual support for seminars, symposiums, and conferences. The TERI School can tap into and gain from TERI's existing infrastructure: state-of-the-art laboratories, well-equipped field stations, and highly experienced workforce.

The TERI School has also evolved an organizational structure bearing TERI's skill-set in mind. It draws upon the expertise of about 30 research professionals holding doctorates and possessing rich experience in the TERI School's areas of activity. Two faculties with the following departments and centres have been constituted to achieve the TERI School's objectives.

- **Faculty of Applied Sciences**, comprising
  - Department of Natural Resources
  - Centre of Bioresources and Biotechnology
  - Centre of Energy and Environment
- **Faculty of Policy and Planning**, comprising
  - Centre of Regulatory and Policy Research.

Work is on to create the following departments in the coming years.

- **Faculty of Applied Sciences**, comprising
  - Department of Biotechnology
  - Department of Energy and Environment



For the academic year 2002/03, 15 students have been admitted to the Ph.D programme

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- **Faculty of Policy and Planning**, comprising
  - Department of Regulatory Studies
  - Department of Policy Studies.

While the centres will mainly carry out doctoral research, the departments will focus on instruction at the master's level. As of now, 28 Ph.D. students, admitted in the academic years 2001/02 and 2002/03, have completed their coursework. In the current academic year (2003/04), the TERI School has launched two M.Sc. programmes in natural resources and environment studies with an intake of 15 students each.

In a bid to consolidate global academic networking, the TERI School has entered into MoUs with many like-minded institutions across the world such as the following.

- School of Forestry and Environmental Studies, Yale University, USA
- La Trobe University and Monash University, Australia
- Donald Danforth Plant Science Centre, St Louis, USA

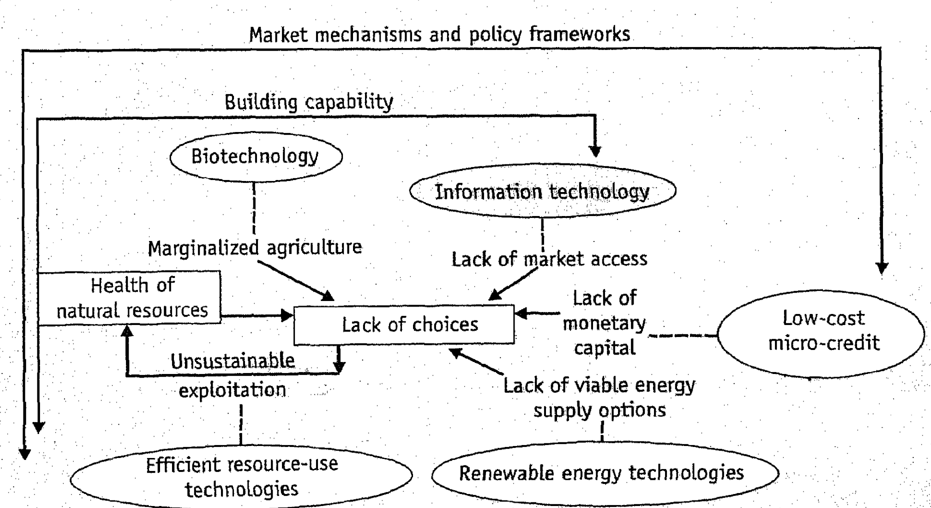
Such inter-institutional cooperation will facilitate mutually beneficial exchange of students, faculty, knowledge, resources, and ideas. This will feed into strengthened academic and research programmes, enhanced curriculum development, and increased joint research projects and publications.

INSTEP Global

Integrating New and Sustainable Technologies for the Elimination of Poverty Global

TERI has been undertaking action-oriented field and policy research for realizing the goal of sustainable rural development for more than two decades now. During this period, we have covered a broad spectrum of activities ranging from providing inputs to national and regional policy initiatives to developing methodologies for decentralized rural management to carrying out applied research at the village level in various sectors such as agriculture, biotechnology, irrigation, forestry, and electrification. TERI's experience at the grass-roots level has shown that development initiatives have hitherto focused largely on specific sectors, and the interventions therein have been independent of cross-sectoral linkages. This is so despite the fact that most of the issues that confront the rural community are interlinked and cross-sectoral in nature. This has resulted in piecemeal solutions that address the symptoms but are not able to tackle the underlying causes of rural poverty.

In order to empower the poor and ameliorate their deprivation, an approach based solely on technological interventions or distribution of income-generating assets or subsidization of basic services is unlikely to yield desired ends. Instead, the said initiatives must be linked with opportunities for livelihood enhancement as well as capacity building of the poor to enable them to optimally utilize these opportunities. This requires the creation of an enabling environment wherein quality products and services are made accessible and affordable for the poorer sections of the rural community. And this is combined with an enhancement of their capabilities as well as maximum opportunity to exploit these capabilities.

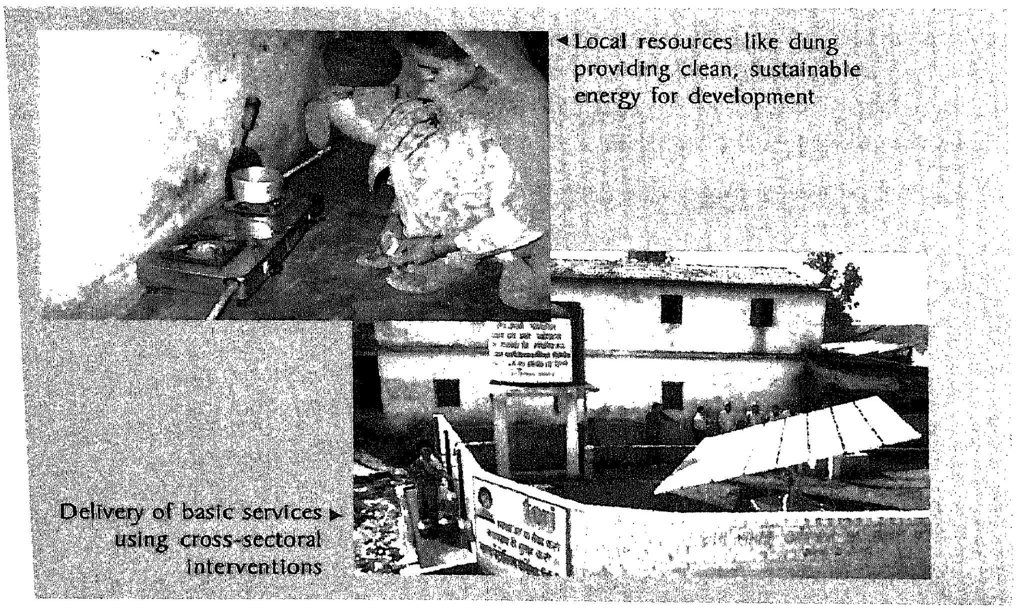


Based on the extensive experience and research carried out by TERI and in cognizance of the major technological developments taking place worldwide in a range of fields, TERI proposes an integrated solutions approach to poverty alleviation in rural areas, called INSTEP (Integrating New and Sustainable Technologies for the Elimination of Poverty) Global. At its core, INSTEP Global recognizes that filling up lacunae in the area of rural poverty elimination by employing technology requires an 'integrated solutions approach', identified and implemented with active community participation. This approach encompasses

- technological solution sets taking into account agriculture, rural energy, information and communication, and natural resource management, and
- conditions enabling technology diffusion—technology adaptation to specific needs, building capability of the community, microfinancing, market mechanisms, and appropriate policy frameworks at the level of governments, NGOs, corporates, and bilateral and multilateral organizations.

This holistic approach is not only expected to be more sustainable but also to help in meeting the social objectives of development—fighting discrimination and empowering people (especially the vulnerable groups such as women, disabled, landless, and scheduled castes and tribes).

With this understanding, INSTEP Global has the potential to greatly enhance our understanding of poverty and the technological solution sets that impact its various dimensions, the socio-economic baseline conditions for such interventions, and local capacity required for the same. The methodology employed for this would include grass-roots projects, literature survey, primary and secondary data collection and analysis, and stakeholder dialogue, workshops, and conferences. This study would also identify policy frameworks, at the level of national and local governments, NGOs, multilateral and bilateral organizations, and the corporate sector, required to create an enabling environment that would facilitate the adaptation of these choices at the grass-roots level.



◂ Local resources like dung providing clean, sustainable energy for development

Delivery of basic services ▸ using cross-sectoral interventions

In this initiative, TERI would involve, among other partner institutes, the World Business Council for Sustainable Development and the Asian

Energy Institute, a network of recognized institutions of excellence, with 15 members and 13 associate members from various countries, undertaking research, information dissemination, technology transfer, and contact with regional policy-makers. TERI is also holding discussions with corporate organizations, foundations, and multilateral organizations to mobilize support and partnerships.

INSTEP Global would provide replicable models of excellence that provide grass-roots solutions but address generic problems of rural development. This, we hope, would be an important step forward in enabling the poor to overcome deprivation and improve the quality of their lives.

Delhi Sustainable Development Summit 2003

Sustaining the WSSD momentum

In 1987, the Brundtland Commission Report defined sustainable development as 'development that meets the needs of the present without compromising the ability of future generations to meet their own needs'. A decade and a half later – with the earth's climate imperilled, its rich biodiversity impoverished, and its natural resources imbalanced (largely due to human actions) – we are still struggling to operationalize the 'sustainability' of our development. Our efforts, spread across regions and issues, should be informed by a clear mission and imbued with collective vision and resolve.

Committed to sustainable development, TERI has undertaken the major responsibility of continuously stimulating debate on various aspects of sustainability. To that end, the annual DSDS (Delhi Sustainable Development Summit) assembles the world's finest minds to deliberate upon related themes and formulate recommendations, which help shape policies. Distinguished speakers from across five continents, representing diverse constituencies, are joined by over 300 delegates, who participate actively in the discussions.

Held in the wake of the WSSD (World Summit on Sustainable Development, which set priorities for action, DSDS 2003 (6 to 9 February) essentially focused on translating those priorities into action. Titled 'The Message from WSSD: translating resolve into action for a sustainable future', it added value to the Johannesburg process through many action-oriented suggestions for the global community.

Inaugural session: setting the tone



Centre Dr A P J Abdul Kalam, Hon'ble President of India
To his right Mr T R Baalu, Hon'ble Minister for Environment and Forests, Government of India; Dr Sam Pitroda, Chairman and Chief Executive Officer, WorldTel Ltd; Dr R K Pachauri, Director-General, TERI
To his left Dr A Ramachandran, Chairman, TERI; Mr Nitin Desai, Under-Secretary-General, United Nations; Mr Chad Holliday, Chairman and Chief Executive Officer, DuPont

Inaugurating DSDS 2003, the Hon'ble President of India, Dr A P J Abdul Kalam, said that a developing nation needs an integrated developmental plan and empowered management structures for education and healthcare, agriculture and food processing, ICT (information and communication technology), strategic sectors, infrastructure, and

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geopolitics and ecology. Fundamental action in these areas would help eliminate poverty—a huge challenge for India. He stressed that ecology and the environment must be made partners in the development process.

Dr Kalam said that any nation that envisions a prosperous, peaceful, and safe society for its people has to empower them first. A child, empowered by his/her parents, grows up into a responsible citizen. A teacher, empowered with knowledge and experience, moulds good young human beings with unshakeable values. A woman, empowered with equity and justice, helps create a stable society. When an institution's leader empowers his/her people, more leaders are born that can change the nation in multiple areas. When leaders empower their people through visionary policies, the nation's prosperity is assured. When religion transforms into a spiritual force, people become enlightened citizens.



Any nation that envisions a prosperous, peaceful, and safe society for its people has to empower them first

A P J Abdul Kalam

Mr T R Baalu, Hon'ble Minister for Environment and Forests, Government of India, said that poverty was the WSSD's fundamental concern along with the related issues of health, water, and sanitation. Independent India has followed a planned development approach and dramatically improved the condition of its people. It should now ensure the use of the 'global commons' upon equitable entitlements; all human beings and nations should know the limits within which to conduct economic activities. He emphasized the imperative of social sustainability, which requires responsive, reliable, and resilient strategies.



Produce ecologically, consume economically, and share equitably

T R Baalu

Stressing that the WSSD is part of a comprehensive international initiative towards sustainability along with the MDGs (millennium development goals) and the Monterrey and Doha summits, Mr Nitin Desai, Under-Secretary-General of the United Nations, underscored the importance of swiftly implementing the summit agreements. The attainment of the MDGs will lead to further change and, by 2015, perhaps, global disparities in gender equality, poverty, and educational attainment will decrease, and consumption patterns be harmonized with the environment. He added that the DSDS should focus on bridging the gap between promise and performance.

Dr Sam Pitroda, Chairman and Chief Executive Officer, WorldTel Ltd, spoke about the role of ICT in promoting sustainable development, adding that its potential has neither been fully understood nor realized yet. Taking ICT to the masses is a massive challenge, overcoming which could bring about transparency, connectivity, decentralization, democratization, and, ultimately, societal transformation.

Mr Chad Holliday, Chairman and Chief Executive Officer, DuPont, reiterated the three 'must-dos' for businesses hoping to achieve sustainable growth: (1) following unshakeable values in good and bad economic times; (2) understanding 'stakeholders', not merely 'stockholders'; and (3) basing growth on genuine scientific innovation, not simply profitability.

Dr A Ramachandran presented the significance of the DSDS series of events and how it has come to be seen as a landmark activity for sustainable development. TERI, as a global institution, has been able to attract excellent talent from across the world for this event annually, the only one of its kind in the developing world. DSDS 2003 would, he hoped, provide some substantive ideas and plans for implementing the agreements from Johannesburg. He called upon governments, businesses, and communities to take advantage of the proceedings at the WSSD and use the DSDS forum to translate the paperwork of Johannesburg into concrete action plans. He also stressed the need to match appropriate policies with technological progress to attain development goals.

Boosting the momentum for global sustainability

WSSD goals for water and sanitation: making it happen

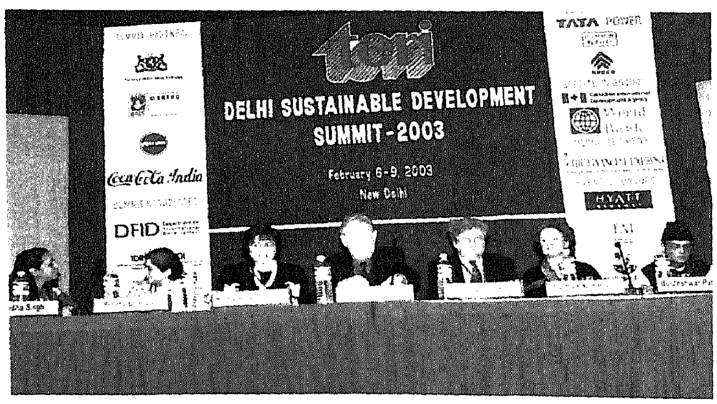
In the light of Johannesburg's call for providing clean water and sanitation to the poorest by 2015, this session focused on relevant institutional issues, indigenous solutions, and inter-sectoral coordination. It recommended integrated water resources management by prioritizing mountain watersheds, eliminating disparities in up/downstream linkages, and decentralizing, such that national policy met community needs. Communities must be empowered to make financial/operational decisions about their own water supply and sanitation. The key to better water outreach is public–private partnerships, enabling policies and legal mechanisms, and complementary approaches between service delivery and resource management. Projects geared to supply water on a large scale should be implemented with due concern for ecological and social issues.

Box 1
Looking back to change track



Dr R K Pachauri presented to the Hon'ble President a publication summarizing TERI's proposed project titled *GREEN India 2047 renewed: looking back to change track*. He explained the importance of the *GREEN India 2047 (Growth with Resource Enhancement of Environment and Nature 2047)* project, the first phase of which encompassed 1947–97 and quantified the extent of damage to India's natural resource base in the first 50 years of independence. It revealed shocking degradation and warned that unless alternative development paths were charted out, India would be overcome by impoverished natural resources, social discontent, and economic breakdown.

The alternative scenario envisaged in *DISHA (Directions, Innovations, and Strategies for Harnessing Action) for sustainable development*, the second phase encompassing 1997–2047, outlined various remedial initiatives. The period 1997–2002 saw developments in many areas; TERI felt it necessary to carry out a reappraisal of where we are and where we are going. This forms the basis of the *GREEN India 2047 renewed project*.



Meeting basic needs while protecting the environment

Economic growth remains an effective route to simultaneously decreasing poverty and improving environmental conditions. Well-designed local governance can encourage the poor to address environmental degradation, since it directly victimizes them. Dependence on regulatory interventions should be limited. Economic instruments like pricing policies are preferred options owing to lower implementation costs and higher resource-use efficiency. 'Appropriate' technologies, developed through community partnerships, are low-cost, easily accessible, and meet local needs while ensuring higher efficiency and productivity. Their rapid penetration reveals their importance in enhancing livelihood opportunities. They must optimize energy efficiency and minimize resource requirements and waste.



Environment, health, and education: solutions in a knowledge economy

In both developed and developing nations, the lack of knowledge, of institutional capacity, and of robust governance form major barriers to the operationalization of sustainability. Capital flow into sustainable projects is vital. Financial institutions must include socio-economic costs in valuing sustainable projects. Collaborative efforts should address the following needs.

- Knowledge solutions to produce meaningful development
- Institutional strengthening and capacity building to successfully implement and disseminate knowledge solutions
- Empowered local governance to enhance interaction with people on environment, education, and health.



Land use, forestry, and biodiversity

Resource managers must appreciate that natural resources symbolize the sole source of livelihoods for most communities living in/around forested areas. Sustainability must be carried to the local level, where poverty really exists. Channels are required to link people with policies and bottom-up approaches and facilitate cross-sectoral integration. These imply understanding the links between impacts of land tenure, common property resources, benefit-sharing mechanisms, and trade on people's access to resources and ecosystem protection. Combating increasing pressures on land, forests, and biodiversity require multi-dimensional efforts, integrating conservation with economic development. Corporates must uncover value-added business opportunities, particularly in rural areas, to help local communities capitalize on their rich resource bases. Multi-stakeholder alliances are needed for science and technology, including biotechnology, so vital for food security.



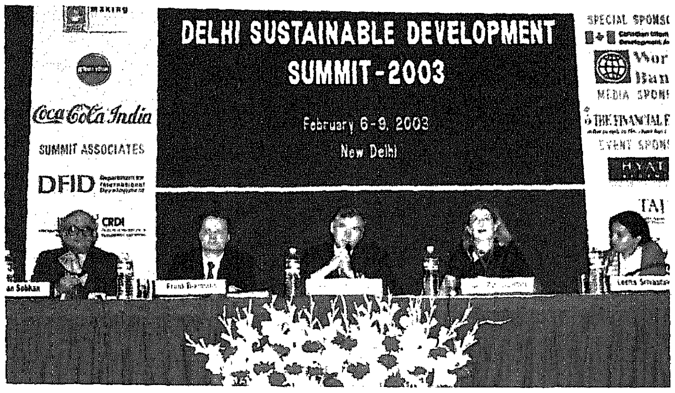
The role of the media in sustainable development

The panel recommended that instead of 'ghettoizing' the environment by putting it into an exclusive channel/page, it should be brought into the mainstream. Public sector broadcasting is extremely important, as it highlights the issues of change and development. Detailed reporting of sustainability issues and concepts is vital. The media could report good uses of technology and facilitate contact with the innovators.



Governance issues in sustainable development

Global environmental governance aligns international actors, institutions, and political processes to the demands of the sustainability transition. Donor agencies should take care not to impose their views on recipient governments, which indeed have the greater role in setting sustainability priorities. Systems to encourage local participation and decentralized approaches must be strengthened. The panel made the following recommendations.



- Empower the deprived by accumulating the required resources at local levels.
- Provide ownership and management rights over resources to the deprived.
- Legitimize community-based participatory approaches.
- Transform micro-finance into corporate finance owned by the poor.
- Graduate the poor higher up in the market chain of value addition by developing income-earning assets in all sections of society.

Climate change: many paths, many stakeholders

This session focused on (1) immediate action to achieve long-term objectives of the climate convention, (2) the need for adaptation, and (3) partnerships for moving towards a carbon-constrained economy. It recommended immediate action to introduce new technologies for reducing emissions and stabilizing atmospheric GHG (greenhouse gas) concentration. It also discussed the Johannesburg notion of partnerships, which emphasizes appropriate measures by the business community, in tandem with governments and NGOs. Such partnerships would help align objectives other than that of climate change, such as poverty eradication, thereby ensuring holistic sustainable development. The business community perspective was elaborated to highlight the creation of GHG markets in addressing climate change, which would also support sustainable development through capacity building, technology transfer, and financing.



Global leadership for the environment

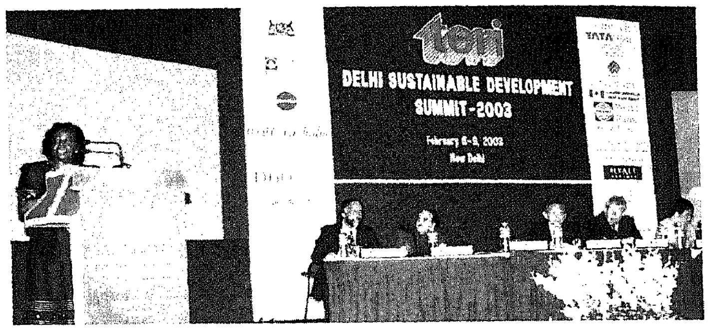
The panellists of the ministerial session exchanged experiences of planning and coordination to achieve environmental protection and natural resource management. While South Africa has formed focused cabinet clusters, India is collaborating with developed nations to assess global/local impacts of climate change. The UK encourages collaborative efforts for efficient use and management of water resources and has launched a National Forest Programme to tackle illegal logging, forest certification, timber procurement, and forest protection/restoration.

Ministerial session

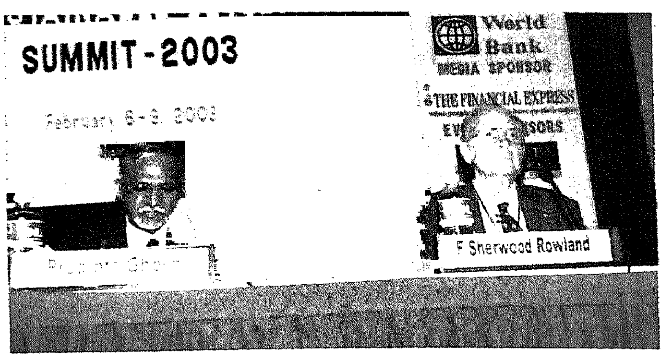
Chairperson
Prof. Emil Salim, Chairman, National Economic Board, Indonesia

Speakers
Ms Rejoice Mabudafhasi, Deputy Minister for Environmental Affairs and Tourism, South Africa
Mr Elliot Morley, Parliamentary Under-Secretary (House of Commons) for Fisheries, Water, and Natural Protection, Department for Environment, Food and Rural Affairs, UK
Prof. Saifuddin Soz, Member of Parliament and former Minister for Environment and Forests, India
Mr Pieter van Geel, State Secretary, Ministry of Housing, Spatial Planning, and the Environment, The Netherlands

Commentary
Dr R K Pachauri, Director-General, TERI



The session recommended a three-fold approach focusing on necessary institutional frameworks, capacity building for role players, and an advocacy, information, and reporting mechanism. Ministers should go beyond environmental establishments to institutionalize processes that incorporate innovative ideas and a far-sighted technological vision. Highlighting the need to incorporate the basic issues of sustainable consumption and production in evaluating the progress of sustainable development measures, it was stressed that targeted soul-searching should be incorporated in development assistance at both the giving and receiving ends.



Striking the key notes

Climate of change

Prof. Sherwood Rowland's address traced the earth's atmospheric vicissitudes. Changing concentrations of trace gases cause three major problems: stratospheric ozone depletion, photochemical smog, and, perhaps the most topical, global warming. The earth warmed by about 0.6 °C over the 20th century. A natural

greenhouse effect caused by trace gases warms the earth's surface. The current concern is not whether there is a greenhouse effect (indeed there is) but what its magnitude could be due to additional accumulation of such gases.

The Intergovernmental Panel on Climate Change has developed many scenarios for future GHG emissions. Prof. Rowland observed, 'Changes over the last several decades are likely mostly due to human activities, but it cannot be ruled out that a significant part is also a reflection of natural variability.' Answering a query about hydrogen fuels, he said that the hydrogen economy would take 30–40 years to become commercially viable.

Growing responsibly



Mr Ian Johnson said that beyond national averages of economic growth, we must target the benefits of such growth at the poorest in society. Environmental sustainability is particularly relevant. Nearly 1.3 billion people eke out subsistence livelihoods from natural resources, with 'environmental incomes' constituting 30%–40% of their incomes. It is the poor that suffer the most when water and air resources are polluted; of the nearly 100 000 lives that natural hazards claim annually, as many as 97% are lost in developing countries. Improving health is not merely about service delivery but also about combating the root causes of ill health.

Responsible growth also requires social sustainability, two major aspects of which are good institutions and income distribution benefiting the poorest. Institutions for responsible growth must respond to people's demands through inclusive and transparent decision-making. Reliability in providing basic services – health, education, transport, and so on – is necessary.

Innovative technology for sustainable growth

Emphasizing DuPont's technological innovations in promoting sustainability, Mr Chad Holliday said that DuPont's commitment towards society and environment is manifested in its core values: safety and health, environmental stewardship, respect for people, and superior ethical standards. He underscored three vital ingredients of sustainability: (1) integrated science, the innovation driver; (2) knowledge intensity, the structural driver; and (3) productivity, the operational driver. He added that the fruits of new technology must reach the poor; only then would it be truly 'fruitful'.

Advocating that the perspective of business should be to look beyond technology and treat software/services as important components, he highlighted some examples of DuPont's enabling waste minimization and productivity enhancement to benefit its customers.



Having implemented Six Sigma, DuPont has trebled its adoption of new technologies/processes; significantly reduced global air carcinogens and hazardous waste; and achieved over 30% growth in production in a decade without increasing energy usage.

Sowing the seeds of sustainability

Prof. Y K Alagh said that the 0.5 Mha (million hectares) of land under appropriate water and land regime cropping patterns in India is sustainable, providing energy and food to the poor. The larger challenge is to bring another 2.5 mha under the regime, implying three major policy requirements.



1. An organizational structure to support community organizations that are not purely corporate or governmental
2. A proper financial mechanism for replicable programmes/projects
3. A support system to meet upfront costs in historically abandoned areas, deprived of infrastructure (different from subsidies).

Prof. Alagh called for agricultural diversification to eradicate malnutrition from rural Asia. A shift to high-value-added sustainable agriculture will enable communities to fund themselves, as evidenced in Indonesia, the Philippines, and Thailand, where poverty rates have declined considerably.

The last word

Revisiting Johannesburg, the valedictory session covered a gamut of issues related to sustainable development, especially key areas of water and sanitation. Johannesburg committed the will and resources to make available freshwater and access to sanitation to the millions who lack them



Chairperson
Prof. Klaus Töpfer, Executive Director, United Nations Environment Programme, Nairobi

Speakers
Mr Björn Stigson, President, World Business Council for Sustainable Development, Switzerland
Dr Claude Martin, Director-General, WWF International, Switzerland
Ms Anu Aga, Chairperson, Thermax Ltd, India
Mr V K Duggal, Special Secretary, Ministry of Environment and Forests, India

Vote of thanks
Dr R K Pachauri, Director-General, TERI

currently. This implies the need for innovative programmes, resources, technologies, and partnerships at the local, regional, and global levels.

The corporate sector has the necessary financing, technology, and management skills available to make a significant contribution. As urged by the WSSD, now is the opportunity for corporates to embrace sustainability and accept their accountability and obligation towards partners and stakeholders. *The business of business is to promote the well-being of all stakeholders on this planet.*

Good governance and corporate social responsibility run parallel to sustainable development as they promote the accountability of businesses to a wide range of stakeholders – the environment, employees, communities, etc. – now and in the future. Business is the only organized sector that can make an impact because of its economic muscle and its power to influence change. In partnership with the government, NGOs, and civil society, corporates can make a real difference to the lives of millions.

Sustainable development issues are complex and must be tackled through integrated efforts of business organizations, governments, and civil society. The session recommended the following to reinforce the Johannesburg process.

- Enhance efforts to further partnerships.
- Encourage civil society participation in existing partnerships of NGOs, businesses, and governments.
- Enhance and operationalize North–South partnerships.
- Establish monitoring and measurement mechanisms to forecast and assess long-term impacts of various actions.
- Conserve at all levels: local, regional, and global.
- Mesh legal, institutional, economic, scientific, and technological resources.
- Involve the various stakeholders.
- Operate through long-term, non-compartmentalized approaches.

Human Resources and Infrastructure Development

Human resources development

TERI's 500-plus workforce across the globe comprises a unique mix of seasoned professionals with long stints in research organizations, government, and the industry; young, qualified, and enthusiastic researchers; and capable support staff.

The HRD (human resources development) Cell continuously works towards enhancing the performance and growth of TERI's workforce by

- conducting/organizing training and development sessions;
- improving and modifying systems and procedures;
- introducing welfare measures; and
- conducting organizational surveys.

Training and development

Capacity-building activities are based on an annual training needs assessment. Every employee is exposed to specially selected, customized workshops. In 2002/03, the HRD Cell conducted 54 training programmes imparting appropriate skills to over 300 professionals. The focus of these programmes was on the needs of the group as well as the individual participants. Some areas of training are listed here.



▲ Research professionals undergoing a team-building workshop

Publishing professionals learning the nuances of printing techniques at the National Institute of Design, Ahmedabad ▼



Computer skills: software packages for word processing, data management, project management, graphic illustrations, etc.

Research-related skills: presentation techniques and etiquette, proposal writing, report writing, time management, etc.

Behavioural skills: stress management, positive thinking, team building, inter-personal skills, leadership qualities, etc.

Welfare measures

Apart from professional requirements of colleagues, the HRD Cell also suggests diverse welfare measures, based on felt needs, to the management. It maintains a well-equipped physical fitness centre and has appointed a qualified trainer to conduct aerobic classes.

Organizational surveys

Organizational surveys provide employees the chance to give confidential feedback to the management. Information thus gathered helps identify areas for improvement within the organization. In 2002/03, the HRD Cell conducted an attitudinal survey and has suggested a framework for necessary follow-up. It was on the basis of the findings of this survey that training programmes on stress management and relationship management were initiated.

Some other surveys planned pertain to the following.

- Employee relations
- Organizational climate
- Employee satisfaction
- Perception awareness.

Systems/procedures modification

No organization can progress if its systems are not upgraded to keep pace with change in the society and in the field of operation. Continuously studying TERI's systems and procedures, the HRD Cell suggested a number of improvements.

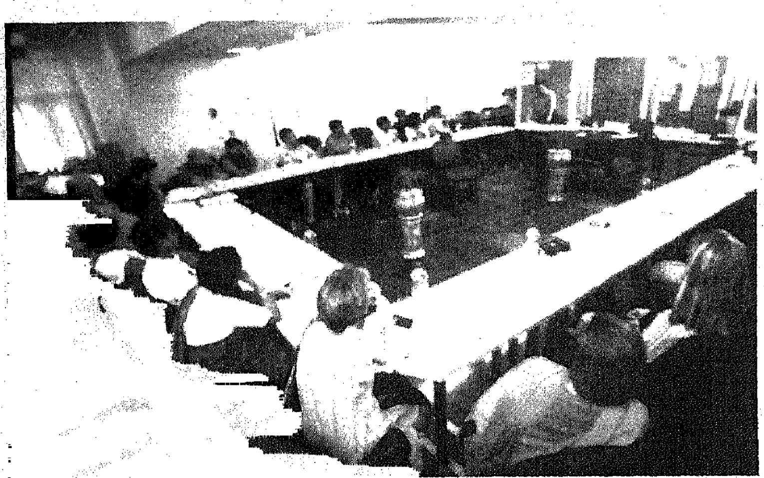
- The organizational induction programme has been modified to include computer-based training to conserve time and improve content quality.
- The appraisal system is being upgraded with the inclusion of the concept of a 360-degree appraisal, making the process transparent and fair. It also helps professionals at supervisory levels to obtain feedback on their work and rapport with their colleagues.
- The filing system is currently been spruced up to facilitate swift retrieval of information.
- A recruit mentoring process has been implemented to smoothen the orientation and learning process.
- In order to further improve the working processes of employees, the HRD Cell is preparing (1) a guidebook and training manual for secretarial staff; (2) a manual for filing systems; and (3) an induction manual.

Sustainable habitat

Amidst the global debate on whether the earth is going to remain habitable in the coming centuries, TERI's vision of achieving sustainable development is purposefully proving a point. Focusing on building models of sustainable habitat, TERI endeavours to send out a striking message to global citizens—'borrow, don't snatch, from nature's resources'. Resources like water, light, and air have sustained life on earth for millions of years, and they will continue to do so if we use them judiciously. The RETREAT (Resource-Efficient TERI Retreat for Environmental Awareness and Training) at TERI's eco-friendly facility in Gurgaon, Haryana, was the first instance of such a vision transformed into reality within TERI's mandate. Most recently, the effort has been replicated, with more vigour and updated expertise, in Latey Bunga, near Mukteshwar, amidst Uttaranchal's thick coniferous forests, providing a pristine panorama of the spectacular Himalayas.

At Gurgaon, Haryana

Located 35 kilometres south of Delhi, the beautifully landscaped 36.5-hectare campus at Gurgaon, Haryana, is a living testimony to TERI's



Conference facility at the RETREAT, Gurgaon

research. With a sprawling garden that features prize-winning roses, the RETREAT has 24 rooms and 6 suites, and modern facilities for conferences, seminars, computer laboratories, dining, and laundry. TERI's approach and commitment is amply demonstrated through the climate-responsive architecture, proper orientation of the building, site planning, judicious landscaping, meticulous planning to induce maximum ventilation, provision for adequate daylighting, use of solar hot-water systems, and integration of energy-efficient lighting with daylighting.

The campus uses a specially designed renewable energy system to meet its energy requirements. A series of photovoltaic panels capture solar energy and store it in a bank of batteries for future use. Novel methods are used to recycle and store rainwater; a unique technique is employed to recycle waste water for irrigation. Water is used efficiently by employing an effective flushing system, aerated taps that deliver water at preset rates, and a centralized laundry.

During 2001/02, the campus has been extensively used by corporate houses for their training programmes. The concepts applied to and the lessons learnt from the RETREAT are being used in several upcoming buildings. TERI organizes awareness-cum-training programmes for architects, builders, corporate organizations, and schoolchildren to disseminate and popularize the concepts used in the RETREAT.

At Latey Bunga, Mukteshwar, Uttaranchal

Located about 50 kilometres from Nainital, at 2300 metres above the sea level, TERI's Himalayan Centre at Latey Bunga provides the ideal environment for uninterrupted academic inquiry. Perched on a ridge in such enchanting environs, the Himalayan Centre conceals a conference venue—you can brainstorm here, while savouring the unique confluence of modern technology and sylvan surroundings with a contemporary flair. Besides state-of-the-art conference facilities, that mainstay of today's corporate existence, the Internet, is on standby. The picturesque colonial-style building is constructed with locally sourced pinewood, complete with fireplaces, panelled walls, and sun-bathed terraces.



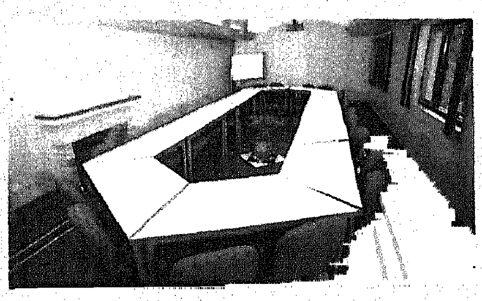
A home away from home: a view of the Himalayan Centre at Latey Bunga, Mukteshwar

Sun rooms – a special feature attached to each suite – help trap the sun's heat to create welcome oases of warmth and light. The conference block has a meeting hall, which can seat about 32 people comfortably, as well as a reception area, a pantry, and restrooms.

Mukteshwar's high altitude makes heat preservation an imperative. The entire structure at Latey Bunga is oriented to optimize the sun's heat and light, both passively and actively, be it in the residential suites, the conference facility, or the kitchen. This means that 100 solar panels, integrated with the sloping roof, trap radiation from the sun, and transfer the energy to the large battery banks, which store it for a rainy day. All the hot water supplied to the residents is heated naturally. Also, warmth from the human body, electrical fixtures, and fireplaces is trapped within the building.



The sun room: a sight to warm your heart



A workplace with a difference

The orientation of the building is south and south-east. Trees have been strategically planted on the northern side to buffer against cold winds while the southern face is left exposed for maximizing energy gain from the sun. Intelligent insulation using fibreglass panels in the ceilings and walls also preserves heat and absorbs sound as well.

Considering the fact that the nearest source of potable water is about 200 metres downhill, work is under way to harvest rainwater, which will be filtered and rendered potable. So, the convenience of piped water comes at no cost to the environment.

The Himalayan Centre at Latey Bunga marks the extension of TERI's focus to Uttaranchal in its relentless pursuit to disseminate its research results to the 'real' beneficiaries at the grass roots, thus facilitating genuine operationalization of sustainability.

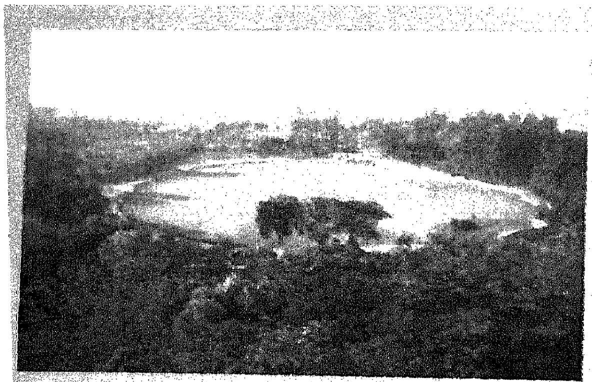
Sports

TERI believes that along with creating intelligent workplaces, one must evolve intelligent professionals. With this objective, it has created excellent infrastructure facilities to enable its staff to take part in various sporting activities. The facilities include a mini multi-gymnasium, a world-class cricket ground (the TERI Oval), a badminton court made of astro-turf, and table tennis equipment. The ever-increasing usage of these

facilities by its staff is proof enough that maintaining or improving the fitness of the mind and body has become an important element in their race-against-time schedules. TERI also organizes a number of tournaments in these games involving Delhi's corporate organizations.

TERI Oval: a patch of green

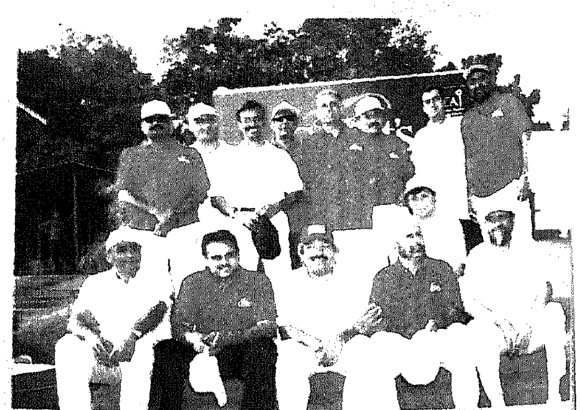
An invigorating verdant oasis amidst the surrounding starkscape, the TERI Oval at Gual Pahari, Haryana, was inaugurated by Mr Bishen Singh Bedi, popular Test cricketer of yore, on 3 October 1999. When cricket matches are on, the rustic sounds resonate with those of bat cracking against ball, shoes swishing through the grassy outfield, and spectators cheering. Enticingly ebony, the mobile scoreboard is chalked over with statistics of promising willow-wielders.


The lush green TERI Oval

Averaging almost 70 metres from the pitch, the boundary is dotted with poplar, eucalypts, *neem*, *sheesham*, bamboo, and *jamun*. The lush green and level outfield thrives under the care of a team of trained gardeners equipped with mechanized mowers, sprinklers, and rollers. TERI's biotechnologists intend to experiment with grass cloning and soil mechanics to enhance the pitch quality.

The firmly-laid wicket comprises five well-conditioned top-turf pitches developed by experts. Three practice pitches – two turf and one cement – are also available. A raised hillock has been terraced into spectator enclosures while pretty rockeries skirt the pavilion. Excellent residential and media facilities are available in the nearby RETREAT; players can stay over to practise or get acclimatized!

During 2002/03, the TERI Oval reverberated with passion-filled cheers of spectators as 20 corporate teams battled their skills and wits under floodlights for the top slot in the prestigious William Grant's Floodlight Corporate Cricket Tournament. The winning team was to go to South Africa to watch the Cricket World Cup 2003. WPP, Mumbai, elbowed its way through the gold rush to earn the top honour. Also, during the tournament, TERI Oval was graced by the presence of distinguished former players – Gordon Greenidge, Anshuman Gaekwad, Yashpal Sharma, L Sivaramakrishnan, Mohinder Amarnath, Syed Kirmani, Balwinder Singh Sandhu, Madan Lal, and others – creating an aura of nostalgia and boosting the confidence of the playing teams. Adding unique excitement to the occasion, just before the final match, the CEOs Six – comprising the heads of six participating organizations – confronted


CEOs Six and Team India 1983

Team India 1983, six players from the World Cup-winning team of 1983, in an exhibition match.

Cricket

TERI organized the highly esteemed TERI Cup Cricket Tournament for the tenth year in succession. Among the 24 top corporate teams that participated, Housing Development Finance Corporation emerged the winner after beating GAIL India Ltd in the final. The D G Phadkar Memorial Cricket Tournament, which is also fast becoming popular in the corporate cricketing circle, was also organized by TERI in 2002/03, for the sixth time in a row. Orient Craft lifted the cup, after a cliffhanger against NIIT in the final. Besides playing several friendly matches with various organizations, TERI participated in the Super Max Cricket Tournament and the Challengers Trophy Cricket Tournament, finishing runners-up in both.



▲ Mr S Sriram, TERI, receiving the Winner's trophy for the First Summer Cup from Ms Anjum Chopra, captain of the Indian women's cricket team

Mr Ramachandran, Chairman, Indian Oil Corporation Ltd, giving away the prestigious TERI Cup to Mr Bansal, HDFC, in the presence of Mr Rajiv Pratap Singh Rudy, Hon'ble Minister for Civil Aviation, Government of India; Dr R K Pachauri, Director-General, TERI; and Ms Anjum Chopra ▼



Table tennis

In the fifth edition of the TERI Table Tennis Tournament – widely acknowledged as the only tournament of its kind for corporates – the Department of Science and Technology edged out the 1999 victors, GAIL India Ltd, in the final and emerged the winners. The tournament saw participation by 12 corporate teams.

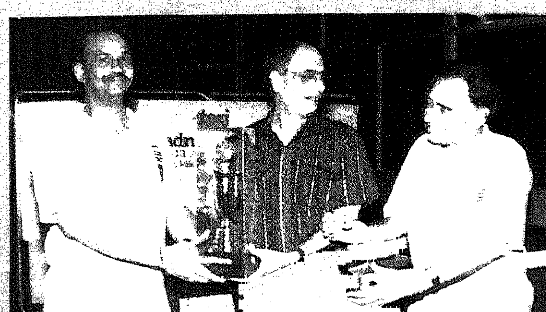
TERI finished runners-up in the Third India Habitat Centre Table Tennis Championship Cup for institutional members. Of the 11 participating teams, TERI and the National Housing Bank made it to the gruelling final.



Table tennis: the team Department of Science and Technology with the TERI Cup

Badminton

The third TERI Badminton Tournament, with eight corporate teams competing for the title and plenty of quality players on the show, was indeed a battle of skills and wits. All the teams displayed their true



Badminton: the captain of the Delhi Development Authority team receiving the TERI Cup

fighting spirits, striving for every point—many of the games stretching for long durations with the service constantly changing. However, the title-decider could well be termed as one-sided as the defending champions, the Delhi Development Authority, continued the winning momentum from their first match and outwitted Siemens with their fast and frenetic pace.

Staff

TERI's organizational structure reflects its flexibility and its largely project-based functioning; teams of professionals with specific skills are put together to match the requirements of a given project. Grouping of the staff into areas and broad-based divisions is TERI's way of encouraging exchange of ideas and information across subject boundaries, and forming interdisciplinary linkages. Area conveners and directors are selected from the professional staff, in fixed-term rotations, to facilitate coordination among areas.

As on 31 March 2003, TERI had 519 employees on its rolls, comprising doctorate holders, engineers, postgraduates, management professionals, publishing experts, and many technicians and other support staff. With headquarters in New Delhi, it has regional centres in Bangalore, Panaji (Goa), Guwahati, and Kolkata; units in Lucknow, Mumbai, Pinjore, Varanasi, and Yamuna Nagar (India), Petaling Jaya (Malaysia), and Tokyo (Japan); and affiliate institutes in Washington, DC (USA) and London (UK). (For the complete staff list, please visit <*www.teriin.org*>)

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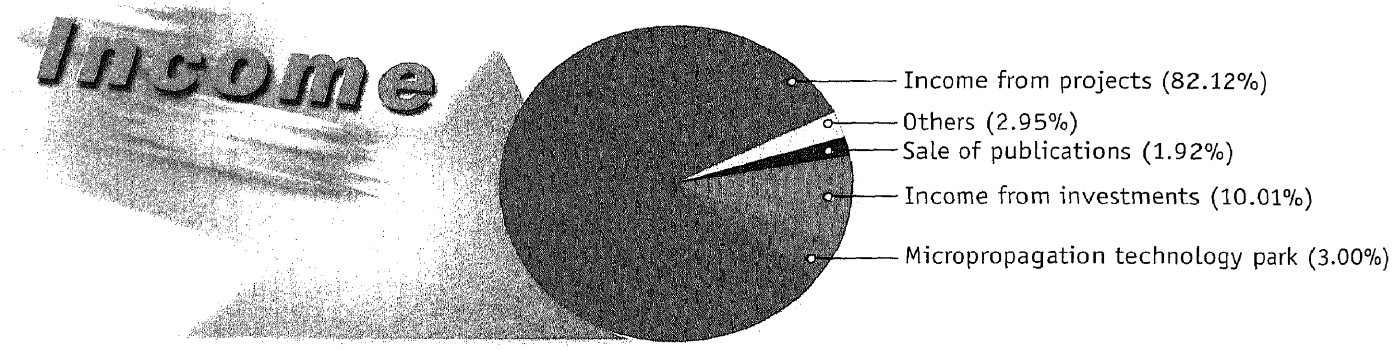
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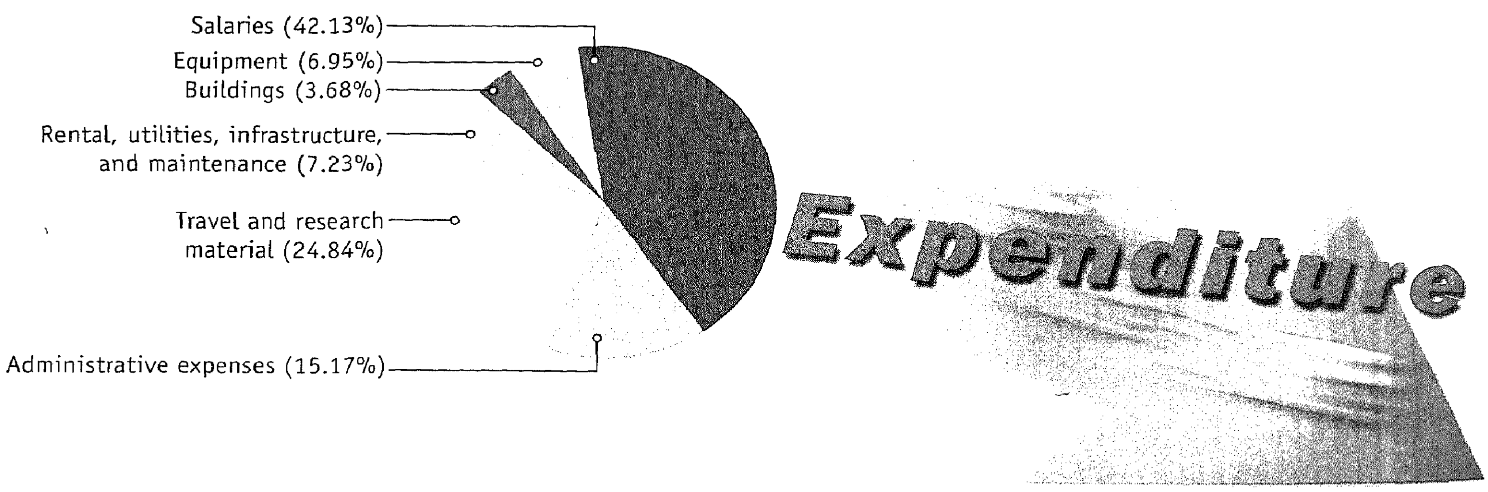
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